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TENTH ANNUAL REPORT

OF THE ,

BOARD

OF

METROPOLITAN SEWERAGE
COMMISSIONERS,

FOR THE

YEAR ENDING SEPTEMBER 30, 1898.

BOSTON :

WRIGHT & POTTER PRINTING CO., STATE PRINTERS,
18 POST OFFICE SQUARE.

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Commonwealth of Massachusetts.

To the Honorable the Senate and the House of Representatives.

The Board of Metropolitan Sewerage Commissioners, created by chapter 439, Acts of 1889, presents its annual report for the year ending Sept. 30, 1898, which, being the tenth annual report, will include a short description and review of the work accomplished by the Board since its organization.

The opening of the Neponset valley system in the present year marks the completion of the third large system of metropolitan sewers now operated by the Commonwealth, and, together with the Charles River and North Metropolitan systems, affords relief for twenty-two cities and towns of the metropolitan district.

These three systems, traversing each the valleys of the Neponset, Charles and Mystic rivers, discharge directly or indirectly into tide water, the Neponset valley and Charles River systems through the Boston main drainage at Moon Island and the North Metropolitan system through its outfall into deep tidal currents off Deer Island.

The work of constructing these systems was entered upon in 1890, soon after the organization of the Board, and has progressed steadily until its practical completion in the early part of the present year. The Charles River system, completed first, was built practically as outlined by the State Board of Health in its report on drainage of the Charles and Mystic rivers (Senate Doc. No. 2, 1889), and serves, with the exception of the cities of Cambridge and Somerville, all of the cities and towns in the Charles River valley from Waltham to and including part of the Back Bay district of the city of Boston. The length of this system is 8.098 miles. Its course, beginning at Waltham, runs in general parallel to and close by the bank of the Charles River, discharging into the Boston improved sewerage at a point in Huntington Avenue opposite Gainsborough Street. Surveys upon this

system were made in the fall of 1890, and ground was first broken for actual construction early in 1891. With work of this magnitude difficulties were frequently encountered; especially so in the more thickly settled districts, at the railroad crossings and where natural conditions of soil were unfavorable. However, such difficulties caused merely delays, and the work on the whole progressed rapidly until its completion in the spring of 1892, when the system was formally opened.

Although the Charles River system was completed first, construction upon the North Metropolitan system was carried on simultaneously, but, owing to the greater magnitude of the work, was slower in progress and much later in its completion.

The North Metropolitan system was designed to serve the cities and towns of the metropolitan district, situated in the valley of the Mystic River, and so much of Charles River valley as lies north of the Charles River and its tributaries, and has a total length of 49.626 miles, necessitating the operation of four pumping plants, — one at North Somerville, one at Charlestown, another at East Boston and one at Deer Island near the outfall. The main line, beginning at Stoneham, traverses the valleys of the Malden and Mystic rivers, is joined by four separate branches, and continues through East Boston and Winthrop to the outfall off the easterly end of Deer Island.

During the five years required to complete this system no delays of a serious nature occurred. Such portions of the work as were too important to entrust to contract labor were constructed by day labor under the direct superintendence of the engineering force employed by the Board. This included in the main part the outfall sewer into the main channel off Deer Island, crossings under streams and the construction of large pump wells connected with the four pumping plants.

The North Metropolitan system, with the exception of four extensions, Wakefield, Stoneham, Lexington and Malden and Everett branches, ordered by the Legislature since that date (which are now nearly finished) was completed and put in operation early in 1896. In the same year work was begun

upon the Neponset valley system, the last of the systems constructed by this Board. This system serves a district including six cities and towns situated in the Neponset and Charles River valleys, and is near the Charles River, Mother Brook and the Neponset River from Newton and Brookline at its upper end to a point in Central Avenue, Dorchester, discharging into the Dorchester interceptor of the Boston main drainage works near Granite bridge. This system was practically completed and put in operation during the present year, and has a total length of 11.30 miles.

As these systems were completed, a regular force of experienced assistants and laborers were employed to maintain them in proper condition and to operate the four large pumping plants now in constant use.

The character and details of this work for the present year, ending Sept. 30, 1898, appear later in the report of the chief engineer to the Board, to which your attention is respectfully called.

Chapter 4, Resolves of 1898, appropriated \$30,000 to carry forward the investigations upon the proposed high-level sewer for the relief of the Charles River and Neponset valleys, which were begun in the early part of 1898 and are still in progress at the present time. Special engineering studies have been made in Boston harbor about Moon and Deer islands, and at possible locations of new outfall near Peddock's Island, and much data compiled for the special report to be made by this Board in the early part of the next session of the Legislature.

The amount expended upon the high-level investigations to date (Oct. 1, 1898) is \$11,810.52, leaving an unexpended balance of \$18,189.48.

The entire cost of the systems thus far constructed, including land damages, is as follows : —

North Metropolitan system,*	.	.	.	\$5,116,695 63
Charles River system,	.	.	.	789,134 27
Neponset valley system,	.	.	.	821,602 32

making the total expenditures to date of \$6,727,432.22. Details of the work for the year follow.

* Including Wakefield, Stoneham, Lexington and Malden and Everett branches.

NORTH METROPOLITAN SYSTEM.

The following settlements for land taken upon this system have been made during the year : —

By deed dated Nov. 23, 1897, recorded with Middlesex South District Deeds, book 2645, folio 351, Nathaniel Munroe, James A. Munroe, George H. Munroe and Susan Munroe, widow, all of Cambridge, release to the Commonwealth “rights, privileges and easements” in land in Cambridge, included within a taking made by the Board, in behalf of said Commonwealth, dated July 19, 1893, recorded with Middlesex South District Deeds, book 2210, page 481. On the fourth day of December, 1897, by deed recorded with Middlesex South District Deeds, libro 2645, folio 352, Patrick Hayes released to the Commonwealth “rights, privileges and easements” in land in Malden, included within a taking made by the Board, in behalf of said Commonwealth, dated July 23, 1892, recorded with Middlesex South District Deeds, book 2133, page 550.

In November, 1897, a settlement for damages to land in Medford, sustained by Elizabeth J. C. Mann, included within a taking made by the Board, in behalf of the said Commonwealth, May 20, 1893, and recorded with Middlesex South District Deeds, libro 2197, folio 139, was made by the Commonwealth, upon execution issued from the superior court.

The claim of the city of Chelsea for damages sustained to the Cary school-house in said city, caused by the construction of Section 14 of the metropolitan sewer by the contractors, the Metropolitan Construction Company, was referred to the Attorney-General’s department, from whom a communication was later received, stating that said case had been settled for the sum actually expended in repairing the building, interest on the same and costs, amounting to \$2,649.33. Of this the said contractors, the Metropolitan Construction Company, agreed to pay \$1,250, the Commonwealth paying the balance (\$1,399.33).

Martin McMahon, the owner of a barn on Addison Street, East Boston (near Saratoga and Wadsworth streets), claimed damage to said barn caused by the construction of the metropolitan sewer under taking dated Sept. 10, 1890. Said claim was adjusted by the payment by the Commonwealth of the sum of \$80, which the said claimant agreed to accept toward raising said barn to a height necessitated by the construction of the sewer.

A settlement was made for damages sustained by a horse and team, belonging to Wm. H. Boylan of 52 Sidney Street, Somerville, occasioned by the settling of the sewer location on Section 35, Somerville. After considering the matter, the Board awarded said Boylan \$10, which sum was accepted by him and accordingly paid.

EXPENDITURES.

The expenditures upon this system (North Metropolitan), including all payments on account of contracts during the year ending Sept. 30, 1898, amount to \$9,785.61. This, with the amount previously reported, \$4,998,577.77, makes the total expenditures \$5,008,363.38 on this system proper, to date.

WAKEFIELD BRANCH.

The work of construction upon this branch (provided for by chapter 414, Acts of 1896) was begun early in 1897, and the certificate of completion was presented by the chief engineer and accepted at the meeting of the Board held Dec. 11, 1897. The appropriation made by chapter 414, Acts of 1896, proved to be too small by \$5,000, and chapter 88, Acts of 1897, provided the additional amount asked for and enabled the completion of this work.

There has been expended during the year upon the Wakefield branch \$8,281.36, which, with the amount previously reported, \$27,325.09, makes \$35,606.45 expended to date.

STONEHAM BRANCH.

Chapter 436, Acts of 1897, appropriated \$10,000 for the extension of the metropolitan system to the Stoneham town line. The work of construction on this branch was begun in

July of 1897 and the certificate of completion was accepted by the Board Dec. 4, 1897.

The expenditures on the Stoneham branch have been during the year \$8,764.70. This, with the amount previously reported, \$2,802.68, makes \$11,567.38 expended to date.

LEXINGTON BRANCH.

After some discussion as to when the town of Lexington would be called upon to give payment in case of the acceptance of the act providing an outlet for said town into the metropolitan sewerage system, it was finally decided by the Board that it would follow the policy adopted in the case of the town of Wakefield.

At the meeting of the Board held Feb. 12, 1898, a communication was submitted from Leonard A. Saville, town clerk of the town of Lexington, enclosing a copy of the vote passed by said town at a town meeting held Saturday, Feb. 5, 1898, accepting chapter 520, Acts of 1897, adding a portion of said town to the metropolitan sewerage district. The vote is as follows:—

At a meeting of the inhabitants of the town of Lexington, holden Saturday, Feb. 5, 1898, Article 5 in the warrant for said meeting was as follows: "To see if the town will accept 'An act to provide for the addition of a portion of the town of Lexington to the metropolitan sewerage system,' being chapter 520 of the Acts of 1897;" and when said article was under consideration, it was voted, by a unanimous vote: "That the town accept 'An act to provide for the addition of a portion of the town of Lexington to the metropolitan sewerage system,' being chapter 520 of the Acts of 1897."

A true copy from the record.

Attest: (Signed) LEONARD A. SAVILLE, *Town Clerk.*

On April 2, 1898, the Board executed a deed of taking of land for the Lexington branch, necessary for the carrying out of the provisions contained in chapter 520, Acts of 1897, and for the construction, maintenance and operation of a system of sewage disposal provided for by said act. Said taking and plan is recorded with Middlesex South District Deeds, libro 2645, folio 348.

This taking lies almost wholly in public streets and highways from its beginning at Massachusetts Avenue, near its junction with Lowell Street, thence through Lowell Street near to the bridge over the Lexington & Arlington Branch Railroad, thence across private land to Park Avenue, through Park Avenue to Massachusetts Avenue, thence through Massachusetts Avenue to the Lexington town line. It also includes a parcel of land in Lexington in Massachusetts Avenue extending about 45 feet from said town line.

In accordance with section 2 of chapter 520, Acts of 1897 :
“ The metropolitan sewerage commissioners shall provide an outlet at the Lexington town line in or near Massachusetts Avenue for the sewage of said addition, and, acting on behalf of the Commonwealth, shall take by purchase or otherwise of the town of Arlington the present sewer constructed by said town through Decatur Street, private land, Coral Street, private land, Franklin Street, Lewis Avenue, Medford, Chestnut and Mystic Streets and Massachusetts Avenue to Lowell Street in said Arlington, and shall pay the town of Arlington the cost of the same, less the proportion of the cost assessed on the abutting property ; and the same shall become and is hereby made a part of the main trunk line of sewers belonging to the metropolitan system.”

The Board, at its meeting on Sept. 3, 1898, executed a deed of taking of said sewers in said Arlington, as shown on eighteen plans, entitled, “ Commonwealth of Massachusetts. Plan of land in Arlington, with intercepting sewers therein,” dated Sept. 3, 1898.

Said taking and plans were recorded with Middlesex South District Deeds, book 2683, page 207.

In order to determine how much Lexington shall pay this year as its fair share of the interest and sinking fund requirements under chapter 520, Acts of 1897, the clerk was directed to notify the cities and towns included within the North Metropolitan sewerage district that a hearing would be given by this commission to all parties interested, at its office, 1 Mt. Vernon Street, on Saturday, May 28, 1898, at 10 o'clock A.M. The hearing was held as appointed. Robert P. Clapp, chairman of the Board of Sewer Commissioners of said Lexington, with John F. Hutchinson, chairman of the Board of

Selectmen, and George W. Sampson, one of the assessors of said town, attended. The Board submitted an estimate prepared by the engineer on the same basis as reported by the apportionment commissioners for assessment upon the town of Wakefield, which was discussed by the parties present, the engineer agreeing to furnish Lexington officials with the figures he had previously furnished this Board, showing how the estimate was made up, and the Lexington officials agreeing to furnish this Board with information as to what they consider a fair amount for the town to pay for said charges during the present year.

After considerable study given to the subject under discussion, the Board, at the meeting of June 11, 1898, passed the following vote:—

Voted, Under the provisions of chapter 520 of the Acts of 1897, it is hereby determined that the sum of twenty-three hundred and fifty-three dollars (\$2,353) is the amount to be paid by the town of Lexington for this year (1898) as its fair share of the interest and sinking fund requirements of the North Metropolitan system.

The State department and the town clerk of the town of Lexington were accordingly notified thereof.

At a meeting of the Board, held Sept. 17, 1898, Edward S. Fessenden, chairman, and Winfield S. Durgin, members of the Board of Sewer Commissioners of the town of Arlington appeared in regard to the amount to be paid said town for the sewers taken by the Board under chapter 520, Acts of 1897, said town having given said sewer board authority to adjust the matter. They agreed to have action taken by the town, agreeing that said town shall pay over to the State all future moneys assessed on the said sewer taken by the Commonwealth. It was accordingly

Voted, To pay the town of Arlington forty thousand dollars (\$40,000) on account.

Said payment was made said town Sept. 17, 1898.

The expenditures upon the Lexington branch have been \$56,583.69 to date.

EVERETT BRANCH.

The Legislature of 1898 also passed an act, chapter 215, providing for an additional outlet for the city of Everett, and on April 30, 1898, the Board, in accordance therewith, executed a deed of taking of land in Malden and Everett.

Said taking lies wholly in streets of said Malden and Everett, viz.: beginning in that part of Bryant Street, near its junction with Cross Street, and extending through said Bryant Street in said Malden to Rich Street in said Everett. Said taking is recorded with Middlesex South District Deeds, libro 2652, folio 356.

The Board opened bids for the construction of this section (55) April 30, 1898. On May 7, 1898, the contract for said construction was executed with the A. W. Bryne Construction Company. On July 9, 1898, the chief engineer presented the certificate of completion of said work. Said act also called for the taking by the Board of the portion of the local sewer in Malden, beginning at the Metropolitan sewer in Middlesex Street and running easterly through Charles Street, southerly through Main street, northeasterly through Eastern Avenue to the centre of Bryant street to the middle of Cross Street, in said Malden.

On Sept. 17, 1898, a hearing was held with representatives from said city of Malden, concerning reimbursement to be made said city for the taking of its sewers. At a meeting of the Board, Sept. 24, 1898, the chief engineer, to whom had been referred figures for report, submitted the following:—

COMMONWEALTH OF MASSACHUSETTS.

METROPOLITAN SEWERAGE COMMISSION,
OFFICE OF CHIEF ENGINEER AND SUPERINTENDENT,
1 MT. VERNON ST., BOSTON, Sept. 24, 1898.

MESSRS. HOSEA KINGMAN, TILLY HAYNES, GEORGE A. KIMBALL,
Board of Metropolitan Sewerage Commissioners.

GENTLEMEN:—Chapter 215 of the Acts of 1898, section 1, provides for the purchase of one of the main sewers of the city of Malden, and is as follows:—

[Chapter 215.]

AN ACT TO PROVIDE AN ADDITIONAL OUTLET FOR THE SEWAGE OF
THE CITY OF EVERETT.

Be it enacted, etc., as follows:

SECTION 1. The metropolitan sewerage commissioners shall provide an additional outlet for the sewage of the city of Everett and the city of Malden incidentally, and, in acting in behalf of the Commonwealth, shall take by purchase or otherwise, of the city of Malden, the present sewers constructed by said city of Malden, commencing at the metropolitan sewer in Middlesex street and running easterly through Charles street, southerly through Main street, north-easterly through Eastern avenue to the centre of Bryant street southerly through Bryant street to the middle of Cross street in said Malden, and shall pay to the said city of Malden the cost of the construction of the same, and the same shall become and is hereby made a part of the main trunk line of sewers belonging to the metropolitan system.

From the city records I find that this sewer has cost \$52,615.44.

I understand that the city treasurer and city collector will file a certified statement of the assessments levied and collected from this length of sewer to date.

Yours truly, (Signed) WM. M. BROWN, Jr.,
Chief Engineer and Superintendent.

At this date (Oct. 1, 1898) the taking of said Malden sewers has not been made, but plans and other necessary studies have been made, which will enable the Board to execute such taking at a very early date.

The amount expended upon the Everett branch has been \$4,574.73 to date.

CONTRACTS.

Contracts for the construction of Section 53 (Lexington branch) and Section 55 (Everett branch), also contracts for furnishing the additional pumping plant for the Alewife Brook pumping station, were the more important ones made during the year. Bids for the construction of Section 53 (Lexington branch) were opened March 26, 1898, a full list of which will be found in Table B of the Appendix. The bids for the construction of Section 55 (Everett branch) were received and opened April 30, 1898, a full list of which will also be found in Table B. The bids for the additional

pumping plant for the Alewife Brook pumping station were opened Sept. 3, 1898; a full list thereof will be found in Table A. On the same date (Sept. 3, 1898) bids were also opened for additional pumping plants at East Boston, Deer Island and Charlestown pumping stations. At the date of this report (Oct. 1, 1898) the contracts for said additional pumping plants at said stations had not been awarded. Since that time the bid of the Edward P. Allis Company of Milwaukee, Wis., for said pumping plants was accepted and contracts executed for the same.

For the construction of Section 53 (Lexington branch) the Board on April 9, 1898, accepted the bid of Long & Little, fixing the bond for the same at \$4,000, which was furnished, with the American Surety Company of New York as surety. On May 7, 1898, the bid of the A. W. Bryne Construction Company, the lowest for the construction of Section 55 (Everett branch), was accepted and the contract executed. The bond for the same was fixed at \$800, and was furnished, with the National Surety Company of New York as surety. The bid of The George F. Blake Manufacturing Company of New York was accepted, and the contract executed Sept. 17, 1898, for building the proposed additions to the pumping plant at the Alewife Brook pumping station at North Somerville. The bond for the same was fixed at \$3,000, and was furnished, with the American Surety Company of New York as surety.

With the completion of Sections 53 and 55 there will be about 49.626 miles of sewer in this system.

OTHER CONTRACTS.

On Oct. 2, 1897, the bid of John Morrison, received and opened with a number of others, was accepted for furnishing coal for the Deer Island pumping station. From the number of bids received for furnishing coal for the East Boston, Deer Island and Charlestown pumping stations, April 2, 1898, the bid of Sturtevant, Norton & Co. was accepted by the Board. A full list of these bids will be found in Table A of the Appendix.

On March 19, 1898, bids were received and opened for furnishing sewer pipe for use on Section 53 (Lexington

branch), a full list of which is to be found in Table A of the Appendix. At the meeting of the Board, held March 26, 1898, the bid of the Curtis & Pope Lumber Company was accepted for sewer pipe.

On Oct. 2, 1897, an agreement was executed between this Board and the city of Everett for disposing of surface drainage by receiving the same into the metropolitan sewer from the area designated on the plan accompanying the application of said city, by means of catch-basins delivering into its separate systems of sewers connected with the metropolitan sewer, upon the following conditions:—

1. All such catch-basins and connections shall be made subject to the approval of the engineer of the Board.

2. Any and all such catch-basins and connections shall be removed and severed and sealed off whenever this Board shall in writing demand, and all of them shall within five years from this date be permanently removed, severed and sealed off.

3. Such catch-basins shall be kept cleaned out by said city of Everett, so that no considerable quantity of sand shall be delivered into the metropolitan sewer.

4. Said city shall pay to this Board for the use of the Commonwealth at the rate of \$100 per year for such time as such use may be made of the metropolitan sewer, the first payment to be made on the first day of October, A. D. 1898, and a like sum to be paid on the first day of October of each and every year thereafter.

ADDITIONAL PUMPING PLANTS.

Chapter 424, Acts of 1898, appropriates a sum to provide for additional pumping machinery and boilers upon the foundations originally constructed therefor at the Deer Island, East Boston, Charlestown and Alewife Brook pumping stations of the metropolitan sewerage system, to meet the added requirements caused by the increase in the flow of sewage in the North Metropolitan sewerage district. Bids for the same were opened on Sept. 3, 1898, a list of the same appearing in the Appendix in Table A.

PRIVATE TELEPHONE SERVICE FOR ALEWIFE BROOK PUMPING STATION.

It having been deemed advisable to establish a telephone service between the Alewife Brook pumping station and the houses of the engineers of said station for use in emergency cases, the Board forwarded a communication to Jasper N. Keller, general manager of the New England Telephone and Telegraph Company, asking permission to string wires on the poles of said company, in the city of Medford. Such permit was granted by the said New England Telephone and Telegraph Company, provided the Medford city authorities give their permission to place wires on poles in said city. On Sept. 27, 1898, the Board of Aldermen of the city of Medford passed a vote granting the permission asked for.

CONNECTIONS WITH THE METROPOLITAN SEWER ON THIS SYSTEM.

At this date (Oct. 1, 1898), 148 connections have been authorized with the metropolitan sewer on this system. These connections have been made during the period covered by the years 1894, 1895, 1896, 1897 and 1898, the year in each case ending with October 1; and for the benefit of the public we publish below a complete list of the connections authorized on this system to date, said list being published by towns in alphabetical order:—

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
Aug. 24, 1895,	Arlington, .	Henderson Street, at Alewife Brook,	10 inch,	Sept. 20, 1895.
May 9, 1896,	Arlington, .	At the end of the metropolitan sewer in Decatur Street, . .	18 inch,	June 20, 1896.
May 1, 1897,	Arlington, .	Broadway, at Alewife Brook, near town line,	15 inch,	June 19, 1897.
Sept. 3, 1898,	Arlington, .	Lowell and Bow streets, . .	8 inch,	Aug. 30, 1898.
Sept. 24, 1898,	Arlington, .	Park and Massachusetts avenues,	5 inch,	Sept. 27, 1898.
Sept. 24, 1898,	Arlington, .	Massachusetts and Park avenues,	5 inch,	Sept. 21, 1898.
Sept. 24, 1898,	Arlington, .	Park and Massachusetts avenues,	5 inch,	Sept. 24, 1898.
Mar. 2, 1895,	Belmont, .	Near Hills Crossing, . . .	15 inch,	June 13, 1895.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
Aug. 1, 1896,	Boston,* . .	About 200 feet south of shaft at the southerly end of siphon at man-hole in Alford Street, in the park,	15 inch,	Sept. 28, 1896.
Oct. 10, 1896,	Boston,* . .	Navy Yard, on the northerly side of the metropolitan sewer in said yard,	15 inch,	Nov. 1, 1896.
Dec. 5, 1896,	Boston,* . .	On Chelsea Street, opposite Vine Street,	15 inch,	Mar. 2, 1897.
Mar. 27, 1897,	Boston,* . .	Water Street, near Wapping Street,	15 inch,	To be made.
Mar. 27, 1897,	Boston,* . .	Chelsea Street, near Medford Street,	24 inch,	Mar. 30, 1897.
June 19, 1897,	Boston,* . .	Rutherford Avenue, near Dunstable Street,†	24 inch,	June 25, 1897.
Sept. 14, 1895,	Boston,† . .	Orleans and Decatur streets,†	16 inch,	Oct. 11, 1895.
Nov. 30, 1895,	Boston,† . .	Butler Avenue, Orient Heights,	12 inch,	Jan. 23, 1896.
May 23, 1896,	Boston,† . .	Condor Street, near Meridian Street,	15 inch,	Aug. 14, 1896.
Dec. 12, 1896,	Boston,† . .	Border Street, near Decatur Street,†	12 inch,	Feb. 26, 1897.
Nov. 28, 1896,	Boston,† . .	At the junction of Bremen and Porter streets,†	18 inch,	Nov. 30, 1896.
Dec. 5, 1896,	Boston,† . .	Condor Street, near Meridian Street,	12 inch,	Jan. 26, 1897.
Jan. 19, 1897,	Boston,† . .	Border Street, near Eutaw Street,†	12 inch,	Apr. 2, 1897.
Jan. 19, 1897,	Boston,† . .	Border Street, near Lexington Street,†	10 feet,	Apr. 27, 1897.
Feb. 13, 1897,	Boston,† . .	Butler Avenue, corner Saratoga Street (temporary),	-	-
June 12, 1897,	Boston,† . .	New Street, at Sumner Street,	12 inch,	June 14, 1897.
June 12, 1897,	Boston,† . .	House, Bennington Street, near Saratoga Street,	-	-
July 31, 1897,	Boston,† . .	Maverick Street, near Jeffries Street,†	12 inch,	July 30, 1897.
July 31, 1897,	Boston,† . .	Maverick Street, near Cottage Street,†	12 inch,	Sept. 9, 1897.
Aug. 1, 1896,	Boston,§ . .	About Station 19+20,	8 inch,	Aug. 21, 1896.
Aug. 1, 1896,	Boston,§ . .	Station 12+80,	8 inch,	To be made.
Sept. 18, 1897,	Boston,§ . .	Station 22+80,	8 inch,	Oct. 12, 1897.
Oct. 2, 1897,	Boston, . .	Maverick and Lamson streets,	12 inch,	Oct. 8, 1897.
Dec. 4, 1897,	Boston, . .	Jeffries and Sumner streets,	12 inch,	Dec. 23, 1897.
Jan. 15, 1898,	Boston, . .	Marginal and Ruth streets,	12 inch,	Jan. 19, 1898.
Mar. 12, 1898,	Boston, . .	Roland and Crescent streets,	12 inch,	Mar. 28, 1898.
Mar. 26, 1898,	Boston, . .	Marginal and Cottage streets,	12 inch,	Apr. 26, 1898.
April 23, 1898,	Boston, . .	Eagle Square,	18 inch,	June 13, 1898.
April 23, 1898,	Boston, . .	Front Street, near Mason Street,	12 inch,	May 5, 1898.

* Charlestown district.

† East Boston district.

† Connected, but not in operation at this date.

§ Deer Island.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
June 18, 1898,	Boston, . .	Front Street, near Union Street,	12 inch,	July 17, 1898.
July 30, 1898,	Boston, . .	Water Street, near Gray Street, .	15 inch,	Aug. 2, 1898.
Oct. 4, 1895,	Cambridge, .	Corner Portland and Binney streets,	48 inch,	Dec. 4, 1894.
May 4, 1895,	Cambridge, .	Mass. Avenue and Alewife Brook,	15 inch,	June 14, 1895.
May 4, 1895,	Cambridge, .	Belmouth Rindge Avenue, for- merly Spruce Street, . . .	15 inch,	June 26, 1895.
May 4, 1895,	Cambridge, .	Concord Avenue,	15 inch,	Aug. 21, 1895.
July 6, 1895,	Cambridge, .	Mt. Auburn and Lowell streets, .	27×28 in.	Aug. 24, 1895.
Aug. 10, 1895,	Cambridge, .	Mt. Auburn Street, corner Wil- lard Street,	12 inch,	Oct. 11, 1895.
Oct. 4, 1895,	Cambridge, .	Near Concord Avenue, for Niles Bros.' slaughtering establish- ment,	8 inch,	Nov. 30, 1895.
Oct. 4, 1895,	Cambridge, .	Mt. Auburn Street, corner Haw- thorn Street,	18 inch,	Dec. 12, 1895.
Mar. 14, 1896,	Cambridge, .	Dunster Street,	12 inch,	June 1, 1896.
Mar. 14, 1896,	Cambridge, .	Corner Dyke and Plympton streets,	30 inch,	June 30, 1896.
Oct. 19, 1895,	Cambridge, .	Brookline Street, near Cottage Farm station,	10 inch,	Aug. 1, 1896.
July 22, 1896,	Cambridge, .	In private land near Alewife Brook near Mass. Avenue (Tan- nery Brook connection), . . .	15 inch,	Aug. 28, 1896.
Mar. 14, 1896,	Cambridge, .	Pearl Street,	20 inch,	Aug. 31, 1896.
Aug. 10, 1895,	Cambridge, .	North side of Mt. Auburn Street, at Spark Street,	15 inch,	-
Mar. 14, 1896,	Cambridge, .	Waverly and Talbot streets, . .	20 inch,	June 24, 1897.
Mar. 14, 1896,	Cambridge, .	Western Avenue,	22 inch,	Nov. 30, 1896.
Mar. 14, 1896,	Cambridge, .	Eliot Square,	15 inch,	Oct. 24, 1896.
Mar. 14, 1896,	Cambridge, .	Pleasant Street,	20 inch,	Oct. 5, 1896.
Sept. 17, 1898,	Cambridge, .	Albany Street and Massachusetts Avenue,	18 inch,	To be made.
Oct. 24, 1896,	Chelsea, . .	Second Street, near Cypress Street,	15 inch,	Aug. 24, 1897.
Mar. 13, 1897,	Chelsea, . .	Second Street, near Cypress Street,	6 inch,	May 3, 1897.
June 19, 1897,	Chelsea, . .	Marginal Street, corner Haw- thorn Street,	12 inch,	Sept. 9, 1897.
June 19, 1897,	Chelsea, . .	Marginal Street, near Shurtleff Street,	10 inch,	Sept. 8, 1897.
July 3, 1897,	Chelsea, . .	Second Street (temporary only for Metropolitan Water Board),	-	Aug. 24, 1897.
Oct. 30, 1897,	Chelsea, . .	Second Street, at Spruce Street,	18 inch,	Nov. 17, 1897.
Mar. 24, 1894,	Everett, . .	Under tracks of Boston & Maine Railroad, near East Everett sta- tion,	24 inch,	July 3, 1894.
April 20, 1895,	Everett, . .	West Everett, near Faxon's Foun- dry,	20 inch,	July 10, 1895.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
Sept. 18, 1897,	Everett, . .	Second Street (temporary only for Metropolitan Water Board),	-	Sept. 12, 1897.
Jan. 29, 1898,	Everett, . .	Fleet Street Court, Station 12 +44.35 on Section 17, north metropolitan sewer, . . .	15 inch,	To be made.
Nov. 4, 1893,	Malden, . .	Corner Charles and Middlesex streets,	25×38 in.	Jan. 9, 1894.
May 5, 1894,	Malden, . .	Extension of Pearl Street, near boundary line between Malden and Medford,	24 inch,	May 20, 1894.
Aug. 25, 1894,	Malden, . .	Mountain Avenue,	15 inch,	Dec. 17, 1894.
Nov. 3, 1894,	Malden, . .	Medford Street, corner Canal St.,	15 inch,	Mar. 30, 1895.
July 3, 1897,	Malden, . .	Jackson Street (temporary), .	12 inch,	July 24, 1897.
Sept. 10, 1898,	Malden, . .	Bryant and Boylston streets, .	8 inch,	To be made.
May 26, 1894,	Medford, .	Riverside Avenue, near to and east of Gravelly Creek, . . .	18 inch,	June 18, 1894.
May 26, 1894,	Medford, .	South side of the metropolitan sewer in Medford Square, . .	12 inch,	June 13, 1894.
May 26, 1894,	Medford, .	Riverside Avenue, junction of Spring Street,	15 inch,	Oct. 19, 1894.
May 26, 1894,	Medford, .	Riverside Avenue, junction of Park and Marine avenues, . .	12 inch,	Nov. 9, 1894.
Aug. 25, 1894,	Medford, .	In private land at the west end of Canal Street and Boston Avenue,	12 inch,	Sept. 12, 1894.
Aug. 25, 1894,	Medford, .	Corner of Prospect and Cottage streets,	12 inch,	Sept. 14, 1894.
Aug. 25, 1894,	Medford, .	In private land, about 460 feet from the corner of Winthrop and High streets,	12 inch,	Nov. 20, 1894.
July 6, 1895,	Medford, .	Junction Middlesex Avenue and Third Street, Wellington dis- trict,	15 inch,	July 16, 1895.
July 6, 1895,	Medford, .	Craddock Avenue, Wellington district,	12 inch,	Sept. 18, 1895.
Sept. 7, 1895,	Medford, .	Mystic Avenue, at end of Sect. 35,	20 inch,	Jan. 6, 1896.
Sept. 7, 1895,	Medford, .	High Street, rear of St. Joseph's Church,	10 inch,	To be made.
July 1, 1896,	Medford, .	Boston Avenue,	8 inch,	July 23, 1896.
July 22, 1896,	Medford, .	Jerome Street, West Medford, .	12 inch,	Oct. 29, 1896.
April 17, 1897,	Medford, .	House of R. T. Howes, Prescott Street, near Mystic Street (tem- porary),	6 inch,	May 17, 1897.
April 17, 1897,	Medford, .	Houses of Fuller and Forest, at a point about 200 feet west of Bradbury Avenue (temporary),	6 inch,	May 17, 1897.
May 15, 1897,	Medford, .	At west end of Madison Street, .	15 inch,	July 17, 1897.
May 29, 1897,	Medford, .	Riverside Avenue, opposite Lo- cust Street,	15 inch,	June 26, 1897.
Nov. 20, 1897,	Medford, .	Riverside Avenue, near Spring Street, house of Eugene W. Keay,	6 inch,	Nov. 30, 1897.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
Nov. 20, 1897,	Medford, .	Prescott Street, near Allston Street, house of Mrs. Estelle Z. Beakman,	6 inch,	Nov. 29, 1897.
May 7, 1898,	Medford, .	Near Hastings Lane,	8 inch,	May 17, 1898.
Sept. 3, 1898,	Medford, .	House, 350 Riverside Avenue, .	5 inch,	Aug. 23, 1898.
July 21, 1894,	Melrose, .	Corner Wyoming Avenue and Pleasant Street,	20 inch,	Dec. 15, 1894.
Sept. 5, 1896,	Melrose, .	Corner Gould and Pleasant streets,	15 inch,	Sept. 25, 1896.
Sept. 5, 1896,	Melrose, .	Corner Gilbert and Pleasant streets,	12 inch,	Oct. 5, 1896.
May 29, 1897,	Melrose, .	House 45 Myrtle Street (tem- porary),	5 inch,	May 19, 1897.
Dec. 19, 1896,	Melrose, .	At Station 29+05 Essex Street, .	5 inch,	Dec. 21, 1896.
May 1, 1897,	Melrose, .	Myrtle Street, about 210 feet north of Foster Street, . . .	5 inch,	May 11, 1897.
May 29, 1897,	Melrose, .	House, 23 Grove Street, west of man-hole at Myrtle Street, .	5 inch,	May 19, 1897.
May 29, 1897,	Melrose, .	House, 19 Grove Street, near man- hole at Mystic Street, . . .	5 inch,	May 19, 1897.
Dec. 4, 1897,	Melrose, .	Melrose Street extension and Warren Street,	8 inch,	Dec. 7, 1897.
Dec. 4, 1897,	Melrose, .	Melrose Street extension and Gordon Street,	6 inch,	Dec. 10, 1897.
Dec. 4, 1897,	Melrose, .	Melrose Street extension and Warren Street,	6 inch,	Dec. 9, 1897.
Dec. 4, 1897,	Melrose, .	Melrose and Belmont streets, .	6 inch,	Dec. 7, 1897.
Dec. 4, 1897,	Melrose, .	Melrose and Tremont streets, .	6 inch,	Dec. 8, 1897.
Dec. 4, 1897,	Melrose, .	Melrose Street extension and Mendum Street,	6 inch,	Dec. 8, 1897.
Dec. 4, 1897,	Melrose, .	Franklin and Greenwood streets,	8 inch,	Dec. 7, 1897.
Dec. 4, 1897,	Melrose, .	Tremont and Melrose streets, .	6 inch,	Dec. 10, 1897.
Dec. 4, 1897,	Melrose, .	Vinton Street and Brunswick Park,	8 inch,	Dec. 10, 1897.
Dec. 4, 1897,	Melrose, .	Melrose Street extension and Vin- ton Street,	6 inch,	Dec. 10, 1897.
Dec. 4, 1897,	Melrose, .	House 25 Myrtle Street, . . .	5 inch,	Dec. 24, 1897.
Dec. 4, 1897,	Melrose, .	House 160 Franklin Street, . .	5 inch,	Dec. 13, 1897.
Dec. 18, 1897,	Melrose, .	House of S. E. Benson, on Tre- mont Street,	5 inch,	Dec. 21, 1897.
April 23, 1898,	Melrose, .	House 22 Greenwood Street, .	5 inch,	To be made.
April 23, 1898,	Melrose, .	House 199 Tremont Street, . .	5 inch,	Apr. 29, 1898.
June 11, 1898,	Melrose, .	House 121 Essex Street, . . .	5 inch,	June 14, 1898.
June 18, 1898,	Melrose, .	House 1 Franklin Terrace, . .	5 inch,	June 14, 1898.
June 18, 1898,	Melrose, .	House 2 Franklin Terrace, . .	5 inch,	June 14, 1898.
June 18, 1898,	Melrose, .	House 3 Franklin Terrace, . .	5 inch,	June 14, 1898.
July 30, 1898,	Melrose, .	House 199 Essex Street, . . .	5 inch,	Aug. 3, 1898.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
July 30, 1898,	Melrose, . .	House Franklin Terrace, . .	5 inch,	June 14, 1898.
Sept. 24, 1898,	Melrose, . .	Near Franklin Street, . . .	8 inch,	To be made.
Nov. 9, 1895,	Somerville, .	On Mystic Avenue, at Moreland Street,	12 inch,	Mar. 21, 1896.
April 25, 1896,	Somerville, .	Corner Mystic and Winthrop avenues,	30 inch,	May 29, 1896.
May 16, 1896,	Somerville, .	Corner Rowland and Waverly streets,	24 inch,	July 21, 1896.
Sept. 19, 1896,	Somerville, .	Corner Somerville Avenue and Poplar Street,	48 inch,	Oct. 20, 1896.
June 4, 1898,	Somerville, .	Broadway, near Alewife Brook,	12 inch,	Aug. 15, 1898.
July 9, 1898,	Somerville, .	Woodstock Street, near Water- house Street,	12 inch,	Sept. 21, 1898.
Sept. 24, 1898,	Somerville, .	Somerville Avenue and Poplar Street,	2 foot,	To be made.
June 22, 1895,	Winchester, .	Corner Main and Church streets,	10 inch,	Feb. 27, 1895.
June 22, 1895,	Winchester, .	Common Street,	10 inch,	Feb. 27, 1895.
June 22, 1895,	Winchester, .	Rear of freight sheds, Boston & Maine Railroad,	15 inch,	Mar. 21, 1895.
Jan. 26, 1895,	Winchester, .	Near siphon at Mystic station at Abbajona River,	10 inch,	July 21, 1895.
Jan. 26, 1895,	Winchester, .	Old Mystic valley sewer, near Abbajona River,	10 inch,	Aug. 8, 1895.
-	-	Turned the old Mystic valley sewer into the metropolitan sewer,	-	July 18, 1895.
Oct. 3, 1896,	Winchester, .	Easterly side of metropolitan sewer in Cross Street, . . .	12 inch,	Oct. 17, 1896.
Nov. 30, 1895,	Winchester, .	275 feet south of Swanton Street, Station 5+11.20, Section 45, .	15 inch,	Dec. 21, 1895.
Aug. 1, 1896,	Winchester, .	On westerly side of metropolitan sewer in Mystic valley park- way, at man-hole,	18 inch,	Aug. 25, 1896.
Nov. 20, 1897,	Winchester, .	Beggs & Cobbs' currying estab- lishment,	6 inch,	Dec. 6, 1897.
Jan. 27, 1894,	Winthrop, .	Shirley Street, corner Washing- ton Avenue,	12 inch,	Jan. 17, 1895.
July 6, 1895,	Winthrop, .	Pleasant Street, near Belle Isle Inlet,	12 inch,	Aug. 24, 1895.
Oct. 12, 1895,	Winthrop, .	Shirley Street, Short Beach, .	10 inch,	Oct. 29, 1895.
July 22, 1896,	Winthrop, .	At Magee's Corner,	12 inch,	Oct. 8, 1896.
May 25, 1895,	Woburn, . .	Corner Canal and Lake streets, .	15 inch,	Oct. 9, 1895.
Sept. 7, 1895,	Woburn, . .	In private land, Baeder, Adamson & Co., glue works settling tanks,	8 inch,	Nov. 9, 1895.
July 6, 1895,	Woburn, . .	Old Mystic valley sewer, at Cross Street,	15 inch,	Sept. 2, 1895.
July 18, 1895,	Woburn, . .	80 feet north of Cross Street, end of old Mystic valley sewer (temporary),	15 inch,	July 18, 1895.

The 151 connections authorized on this system to this date (Oct. 1, 1898) are distributed as follows: Arlington, 7; Belmont, 1; Boston (Charlestown district), 10; Boston (East Boston), 18; Boston (Deer Island), 3; Cambridge, 19; Chelsea, 6; Everett, 4; Malden, 6; Medford, 21; Melrose, 30; Somerville, 7; Stoneham, 2; Winchester, 9; Winthrop, 4; and Woburn, 4.

CHARLES RIVER VALLEY SYSTEM.

No new connections have been made upon the Charles River valley system during the year ending Sept. 30, 1898. The following is a complete list at the present time:—

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
May 3, 1892,	Boston,* . .	Cambridge Street, corner Seattle Street,	15 inch,	May 3, 1892.
May 6, 1892,	Boston,* . .	Rena Street,	12 inch,	May 6, 1892.
Sept. 27, 1892,	Boston,* . .	Western Avenue, foot of Market Street,	18 inch,	Sept. 27, 1892.
Oct. 28, 1892,	Boston,* . .	Western Avenue, near Everett Street,	24 inch,	Oct. 28, 1892.
Jan. 27, 1893,	Boston,* . .	Near Salt Creek,	24 inch,	Jan. 27, 1893.
May 2, 1893,	Boston,* . .	Near Parsons' Brook,	24 inch,	May 2, 1893.
July 1, 1893,	Boston,* . .	Near Faneuil station,	15 inch,	July 1, 1893.
July 12, 1893,	Boston,* . .	Rena Street, corner Bertram Street,	15 inch,	Aug. 25, 1893.
Aug. 19, 1893,	Boston,* . .	Abattoir, Station 24+08,	15 inch,	Sept. 26, 1893.
Aug. 19, 1893,	Boston,* . .	Abattoir, Station 34+63,	15 inch,	Oct. 6, 1893.
Sept. 9, 1893,	Boston,* . .	Abattoir (tripe works),	15 inch,	Oct. 26, 1893.
May 12, 1894,	Boston,* . .	Parsons Street, opposite Taylor's Mill,	24 inch,	July 31, 1894.
Nov. 17, 1894,	Boston,* . .	Corner North Harvard and Spurr streets,	15 inch,	Nov. 20, 1894.
May 24, 1892,	Boston, . .	Brookline Avenue, corner Bellevue Street,	12 inch,	May 24, 1892.
May 30, 1892,	Boston, . .	133 feet north of Brookline Avenue, Back Bay Fens,	6 inch,	May 12, 1893.
May 19, 1894,	Boston, . .	Huntington Avenue, near Parker Street,	12 inch,	May 30, 1894.
Oct. 13, 1892,	Boston, . .	Commonwealth Avenue and St. Mary Street,	18 inch,	Oct. 13, 1892.

* Brighton.

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
Feb. 3, 1893,	Boston, . .	Vila Street,	24 inch,	Feb. 3, 1893.
May 12, 1893,	Boston, . .	Park Commissioners, Adminis- tration Building,	6 inch,	May 12, 1893.
May 19, 1894,	Boston, . .	Huntington Avenue and Parker Street,	12 inch,	May 30, 1894.
July 20, 1895,	Boston, . .	Corner Huntington Avenue and Bryant Street, on south side of metropolitan sewer,	24 inch,	Sept. 19, 1895.
July 20, 1895,	Boston, . .	Corner Huntington Avenue and Bryant Street, on north side of metropolitan sewer,	12 inch,	Sept. 26, 1895.
April 29, 1892,	Brookline, .	Commonwealth Avenue, corner St. Mary Street,	24 inch,	Apr. 29, 1892.
May 3, 1892,	Newton, . .	At Lemon or Hyde Brook, . .	24 inch,	May 3, 1892.
May 4, 1892,	Newton, . .	California Street, corner Crescent Street,	24 inch,	May 4, 1892.
May 28, 1892,	Newton, . .	Nonantum Street,	10 inch,	May 28, 1892.
Oct. 8, 1892,	Newton, . .	Near Cheesecake Brook, . .	24×36 in.	Oct. 8, 1892.
May 11, 1893,	Newton, . .	California and Said streets, . .	10 inch,	May 11, 1893.
Sept. 1, 1893,	Newton, . .	California and Dalby streets, . .	10 inch,	Sept. 1, 1893.
Oct. 26, 1895,	Newton, . .	In garden of Sarah L. M. Bates, near Hyde Brook,	5 inch,	Nov. 4, 1895.
May 2, 1896,	Newton, . .	In land of estate of Matilda Emerson, east of Hyde Brook,	5 inch,	May 18, 1896.
June 24, 1892,	Waltham, .	Corner North and Calvary streets, at the end of the metropolitan sewer,	-	June 24, 1892.
June 9, 1892,	Watertown, .	California Street, corner Galen Street,	24 inch,	June 9, 1892.
July 9, 1892,	Watertown, .	Watertown Street, corner Cali- fornia Street,	10 inch,	July 9, 1892.
July 9, 1892,	Watertown, .	Water Street, on the east side of the metropolitan sewer, . . .	8 inch,	July 9, 1892.
July 9, 1892,	Watertown, .	Water Street, on the west side of the metropolitan sewer, . . .	8 inch,	July 9, 1892.
May 26, 1893,	Watertown, .	Barker's Starch Factory, . . .	6 inch,	May 26, 1893.
July 1, 1893,	Watertown, .	Hickory Wheel Company, . . .	5 inch,	Never connected.
June 26, 1897,	Watertown, .	At siphon at U. S. Arsenal, . .	18 inch,	July 21, 1897.

The expenditures upon the Charles River valley system, including all payments on account of contracts during the twelve months ending Sept. 30, 1898, but not including expenses of operating, amount to \$11.75. This, with the amount previously reported, \$789,122.52, makes \$789,134.27 as the total expenditures to date.

NEPONSET VALLEY SYSTEM.

The following settlements for land taken upon this system have been made during the year : —

On Oct. 9, 1897, James Burke quit-claimed to the Commonwealth “rights, privileges and easements” in land in Dedham, included within a taking dated July 1, 1896, and recorded with Norfolk Registry, book 764, page 501. Said deed is recorded with Norfolk Registry, libro 820, folio 365.

By deed dated Oct. 19, 1897, recorded with Norfolk Deeds, libro 820, folio 366, Samuel B. and Frederick E. Robinson of Dedham release to the Commonwealth “rights, privileges and easements” in said land in Dedham, included within a taking dated July 1, 1896, and recorded with Norfolk Registry, book 764, page 501.

“Rights, privileges and easements” in land included within a taking made by the Board dated July 1, 1896, and recorded with Norfolk Registry, book 764, page 501, were released to the Commonwealth in land in Dedham by Ann J. Whiting, by deed dated Oct. 26, 1897, and recorded with Norfolk Registry, libro 820, folio 362.

By deed dated Nov. 4, 1897, recorded with Norfolk Registry, libro 812, folio 486, Mary E. Wigley releases to the Commonwealth “rights, privileges and easements” in land in Hyde Park, included within a taking dated April 25, 1896, and recorded with Norfolk Registry, book 759, page 601.

On Dec. 4, 1897, Julian T. Stanley, by deed recorded with Norfolk Registry, libro 820, folio 367, released to the Commonwealth “rights, privileges and easements” in a certain parcel of land in Dedham, included within a taking dated July 1, 1896, and recorded with Norfolk Registry, book 764, page 501. Said deed also releases any claim for damages by reason of any interruption to flowage rights of said Julian T. Stanley in the Neponset River.

John H. Nay of Boston, by deed dated Dec. 7, 1897, recorded with Norfolk Registry, libro 812, folio 483, quit-claims to the Commonwealth “rights, privileges and ease-

ments" in a certain parcel of land in Dedham, included within a taking made by the Board May 29, 1897, and recorded with Norfolk Registry, book 787, page 502.

On Dec. 9, 1897, Richard Hall quit-claimed to the Commonwealth "rights, privileges and easements" in land in Dedham, included within a taking made by the Board July 1, 1896, and recorded with Norfolk Registry, book 764, page 501. Said deed also releases to said Commonwealth any claim by reason of the interruption to the flowage of water from the spring on the grantor's land. The deed of said Hall is recorded with Norfolk Registry, libro 812, folio 487.

Elizabeth A. McDonough, administratrix of the estate of Mary Mulkern, by deed dated Dec. 11, 1897, recorded with Norfolk Registry, libro 812, folio 481, releases to the Commonwealth "rights, privileges and easements" in a certain parcel of land in Dedham, being all the land of the said estate of Mary Mulkern, included within a taking dated July 1, 1896, and recorded with Norfolk Registry, book 764, page 501. On the same date similar rights were taken in land lying in the immediate neighborhood, belonging to Elizabeth A. McDonough, Wm. J. Mulkern and Patrick Mulkern, all of Dedham; and Catherine Mulkern of Newton released to the Commonwealth, by deed dated Dec. 11, 1897, and recorded with Norfolk Registry, libro 812, folio 484.

By deed dated Dec. 20, 1897, recorded with Suffolk Registry, libro 2564, page 430, Edward L. Keith "releases and discharges the said Commonwealth, its officers, agents and servants of and from all suits, actions, claims and demands by me and the heirs of Jonathan B. Baker, for damages" to land in Boston (West Roxbury), included within a taking dated June 5, 1897, and recorded with Suffolk Registry, book 2448, page 6.

A further quit-claim from the said Edward L. Keith releases and discharges the Commonwealth, its officers, agents and servants of and from all suits, actions, claims and demands for damages to land in Dedham, included within a taking dated May 29, 1897, and recorded with Norfolk Registry, book 787, page 502.

On Jan. 18, 1898, Henry H. Thornton of Somerville, by deed recorded with Norfolk Registry, libro 820, page 368,

quit-claimed to the Commonwealth “rights, privileges and easements” in land in Dedham, included within a taking made July 1, 1896, and recorded with Norfolk Registry, book 764, page 501.

Horatio N. Glover, Albert K. Teele and Richard C. Humphreys, trustees under the will of Thomas Liversidge, late of Boston, release to the Commonwealth, by deed dated Jan. 19, 1898, and recorded with Suffolk Registry, libro 2564, page 438, “rights, privileges and easements” in land in Boston (Dorchester), included within a taking dated March 28, 1896, and recorded with Suffolk Registry, book 2347, page 385.

Two deeds for damage to land in Hyde Park, included within a taking dated April 25, 1896, and recorded with Norfolk Registry, book 759, page 601, have been executed. Robert Bleakie, by deed dated March 23, 1898, and recorded with Norfolk Registry, libro 820, folio 369, released to the Commonwealth “rights, privileges and easements;” and on the same day the Robert Bleakie Company, by Charles F. Allen, treasurer, by deed recorded with Norfolk Registry, libro 820, folio 363, released to the Commonwealth similar rights in land in said Hyde Park.

On April 6, 1898, by deed recorded with Norfolk Registry, libro 820, folio 361, Ferdinand F. Favor quit-claims to the Commonwealth “rights, privileges and easements” in land in Dedham, included within a taking dated June 13, 1896, and recorded with Norfolk Registry, book 764, page 5. Said deed also releases any claim for interruption to the flowage rights in the mill pond by reason of said taking, and also for any loss of lumber caused by the construction of said sewer.

Michael Tierney, by deed dated March 24, 1898, recorded with Norfolk Registry, libro 823, folio 409, releases to the Commonwealth “rights, privileges and easements” in land in Dedham, and for full satisfaction of all claims for damage to the crops of the grantor occasioned by the construction of the metropolitan sewer through said premises, under taking dated June 13, 1896, and recorded with Norfolk Registry, book 764, page 5.

At a meeting of the Board, held April 9, 1898, the chair-

man submitted a complaint of George Sauer, corner of Weld and Worley streets, Highland district, West Roxbury, presented by his attorney, Randolph V. King, for loss of water on said premises, occasioned by the construction of the metropolitan sewer, under taking dated June 5, 1897. At the meeting of the Board, held April 13, 1898, the chief engineer reported upon the matter, recommending that \$35 be allowed said George Sauer for draining the well upon his premises, which amount was accepted by said Sauer.

LAND TAKINGS.

The land takings upon this system during the past year have been as follows : —

On Nov. 6, 1897, the Board executed a deed of taking of a certain parcel of land in Dedham and West Roxbury, as shown on two plans, for the purpose of right of way for tramway, teams and foot travel in, over and upon said parcel of land, and the right to deposit and place on and upon said lands material and apparatus during the time of the construction of Section 26 of the Neponset valley sewerage system. The deed of land in Dedham is recorded with Norfolk Registry, vol. 803, page 38, and that of land in West Roxbury is recorded with Suffolk Registry, libro 2489, page 472.

On Jan. 15, 1898, the Board executed a deed of taking of the sewers already constructed by the city of Boston between Granite Bridge, so called, and Central Avenue in that part of said Boston called Dorchester ; the taking of said sewers being adjudged necessary for the maintenance and operation of a system of sewage disposal for the city of Boston and the towns of Dedham, Hyde Park and Milton, in accordance with the plans therefor duly approved and adopted by the Board and approved by the State Board of Health under the provisions of chapter 406, Acts of 1895.

The centre line of the sewers in the latter taking may be described as follows : beginning at the point in Granite Avenue, so called, in Dorchester, it continues for nearly its entire course through private land, alongside the location of the Dorchester & Milton branch of the Old Colony Railroad,

crossing on the way the location of the Shawmut branch railroad, thence through Butler Street, Adams Street, Washington Street and Baker's Court, thence through private land to Central Avenue in said Dorchester, the point of beginning of the taking made by the Board March 28, 1896.

The above taking includes that portion of the Dorchester intercepting sewer, so called, extending from Granite Avenue to Central Avenue, in said Dorchester, to its connection with the main sewer of Boston's main drainage works, near the Calf Pasture. The above taking is recorded with Suffolk Deeds, libro 2501, page 593.

On Jan. 22, 1898, the Board approved an order for the city of Boston, amounting to \$100,000, in payment for the sewer constructed by said city between Granite bridge and Central Avenue, in that part of said Boston called Dorchester, and taken as above as a part of the Neponset valley system.

AGREEMENT WITH THE CITY OF BOSTON FOR RENTAL FOR RECEIVING AND DISPOSING OF SEWAGE FROM THE CHARLES AND NEPONSET RIVER VALLEYS.

On Oct. 1, 1897, a communication was received from Benjamin W. Wells, superintendent of streets of Boston, regarding rental to be paid said city of Boston for use of the city of Boston's main drainage works for the disposal of sewage under chapter 502, Acts of 1897.

On Oct. 9, 1897, a hearing was held, at which His Honor Mayor Quincy, with Messrs. A. J. Bailey, Benj. W. Wells and C. R. Cutter, representatives of the city of Boston, appeared before the Board regarding said question of rental.

On Nov. 6, 1897, a further hearing regarding the subject of rental was given to the cities and towns interested, there being present His Honor Mayor Quincy; A. J. Bailey, corporation counsel; Benj. W. Wells, superintendent of streets; Charles R. Cutter, deputy superintendent; and E. S. Dorr, engineer of sewer division, — all of the city of Boston; together with Charles A. Williams, attorney for the town of Brookline; J. R. Bullard, attorney for Dedham; John L. Harvey, city solicitor of Waltham; E. P. Whitney, sewer commissioner of Milton; Bertram Brewer,

city engineer of Waltham ; and W. S. Slocum, city solicitor of Newton.

Other conferences were had, with the result that on Jan. 1, 1898, the following agreement was signed by the full Board on behalf of the Commonwealth, and by His Honor Mayor Quincy on behalf of the city of Boston : —

AGREEMENT AS TO THE USE OF SEWERS OF THE CITY OF BOSTON.

The Board of Metropolitan Sewerage Commissioners constituted under the authority of chapter 439 of the Acts of the year 1889, acting for the Commonwealth, and the mayor of the city of Boston, acting for said city, authorized thereto by chapter 502 of the Acts of the year 1897, make the following agreement, viz. : —

ARTICLE 1. Said Board shall connect the Charles River sewerage system for the disposal of the sewage of the Charles River sewerage district, consisting of the cities of Waltham and Newton and the towns of Watertown and Brookline and a part of the city of Boston, with the sewer of the city of Boston at the corner of Gainsborough Street and Huntington Avenue in said city of Boston ; and shall connect the Neponset sewerage system for the disposal of the sewage of the Neponset sewerage district, consisting of the towns of Dedham, Hyde Park, Milton, Westwood and a part of the city of Boston, with the sewers of the city of Boston at Granite bridge.

ARTICLE 2. The city of Boston shall discharge the sewage from said systems through its sewers and other works into the water at Moon Island.

ARTICLE 3. The Commonwealth shall pay to the city of Boston, for the use authorized by said last-mentioned act, of said city's sewers and sewerage works by the Charles River sewerage district, and for the discharge by the city of Boston of the sewage from said Charles River sewerage district through said city of Boston's sewers and sewerage works, as follows, to wit. : —

(a) For the year 1896 and for the year 1897 (to be paid in the month of January, 1898), the sum of \$28,007 for each year, in addition to the sum already paid for each year.

(b) For the year 1898 (to be paid in the month of January, 1899), the sum of \$41,559 ; for the year 1899 (to be paid in the month of January, 1900), the sum of \$41,559 ; for the year 1900 (to be paid in the month of January, 1901), the sum of \$41,559 ; each of said sums to be increased by the amount of 74 per cent. of one-fifth of the interest paid by the city of Boston on the cost

of construction of all said sewers and works forming a part of such portions of said city of Boston's system of sewage discharge and works lying between Gainsborough Street and the point of discharge into the water at Moon Island, as shall have been constructed after Oct. 1, 1897, and prior to the month of January in which the payment is to be made: *provided, however*, that no part of the cost of construction of any sewer or work hereafter constructed which said Board and said mayor shall agree, or in case they cannot agree, which a third person selected by said Board and mayor shall find, ought not to be paid by the Commonwealth, shall be used in determining any such amount.

ARTICLE 4. The Commonwealth shall pay to the city of Boston for the use authorized by said last-mentioned act of its sewers and sewerage works for the Neponset sewerage district and for the discharge by the city of Boston of the sewage from said Neponset sewerage district through said city of Boston's sewers and sewerage works, as follows: —

(a) For the year 1898 (to be paid in the month of January, 1899), the sum of \$16,311; for the year 1899 (to be paid in the month of January, 1900), the sum of \$16,311; for the year 1900 (to be paid in the month of January, 1901), the sum of \$16,311; each of said sums to be increased by the amount of 26 per cent. of one-fifth of the interest paid by the city of Boston on the cost of construction of all said sewers and works forming a part of such portions of said city of Boston's system of sewage discharge and works lying between Gainsborough Street and the point of discharge into the water at Moon Island as shall have been constructed after Oct. 1, 1897, and prior to the month of January in which the payment is to be made: *provided, however*, that no part of the cost of construction of any sewer or work hereafter constructed which said Board and said mayor shall agree, or in case they cannot agree, which a third person selected by said Board and mayor shall find, ought not to be paid by the Commonwealth, shall be used in determining any such amount.

ARTICLE 5. The Commonwealth shall pay to the city of Boston for the year 1901, and for each and every year thereafter for the use aforesaid by each of said districts, such sum as shall be determined in accordance with the provisions of chapter 502 of the Acts of the year 1897.

ARTICLE 6. If other provision for the discharge of said sewage from said Charles River sewerage district and said Neponset sewerage district, and payment therefor, shall in any year after the date hereof be made by act of the Legislature of the Common-

wealth, the compensation for that year shall be such as the Legislature shall provide in such act, and the compensations, if any, provided for in this agreement for subsequent years, shall be null and void.

Signed this Dec. 31, 1897.

COMMONWEALTH OF MASSACHUSETTS.

By (Signed) HOSEA KINGMAN,
TILLY HAYNES,
GEORGE A. KIMBALL,
Board of Metropolitan Sewerage Commissioners.

CITY OF BOSTON.

By (Signed) JOSIAH QUINCY,
Mayor.

CLAIMS OF CONTRACTORS.

At a meeting of the Board, Oct. 23, 1897, Haskin & Murphy, contractors upon sections 23 and 24, Neponset valley system, presented their claim for extra work on said sections. On Oct. 30, 1897, the chief engineer reported upon said claim, and, after discussing the matter, the Board voted that it be disallowed.

On Feb. 19, 1898, the day appointed for the hearing to Mathers & Sullivan, contractors upon sections 21 and 22, Neponset valley system, in regard to their claim, B. T. Wheeler appeared on behalf of said contractors, claiming for them a loss of from \$8,000 to \$10,000 on both sections, and asked that they be allowed something therefor. The Board stated that no funds were at present available to settle said claim. No further action was taken to the present time.

The hearing appointed to the National Contracting Company, contractors upon sections 26 and 27, Neponset valley system, for claims upon said sections, was held at this office on May 14, 1898, Charles F. Kittredge, Esq., appearing as attorney for said contractors. It was claimed by both Messrs. Wilmarth and Griffiths, managers for said company, while the work was in progress that the unusually heavy rains at that time were an important element in causing the loss, which was claimed to be \$52,971.67. The Board, after

hearing the said claim, instructed the chief engineer to examine the same. Further consideration of the claim was suspended, and the clerk was instructed to notify the attorney that it was of no use for the Board to take action at the present time, as there was no appropriation available for such purpose.

OVERFLOWS.

The following communication, dated March 4, 1898, from the State Board of Health, relating to overflows on the Neponset valley system, was received : —

OFFICE OF THE STATE BOARD OF HEALTH,
STATE HOUSE, BOSTON, March 4, 1898.

To the Board of Metropolitan Sewerage Commissioners, Boston, Mass.

GENTLEMEN : — The State Board of Health received from you, on July 13, 1897, an application requesting the advice and approval of the Board concerning automatic overflows and regulators at certain connections with the metropolitan sewer in the Neponset valley, as follows : —

The Board of Sewer Commissioners of the town of Hyde Park have made application to the Metropolitan Sewerage Commissioners for permission to make connection with the Neponset valley intercepting sewer at five points, as follows : —

By a twelve-inch branch on the westerly side of the metropolitan sewer in Fairmount Avenue between the New England Railroad and Neponset river, Hyde Park (Section No. 1).

By a twelve-inch branch on the northerly side of the metropolitan sewer in Hyde Park Avenue, near Factory Street, Hyde Park (Section No. 2).

By a fifteen-inch branch on the westerly side of the metropolitan sewer in extension of Arlington Street and Metropolitan Avenue, Hyde Park (Section No. 3).

By eighteen-inch branch on the easterly side of the metropolitan sewer between Neponset River and New England Railroad, Hyde Park, opposite extension of Milton Avenue (Section No. 4).

By twenty-inch branch on the southerly side of the metropolitan sewer in Hyde Park Avenue, being the outlet for sewerage Section No. 8, Hyde Park.

It is the desire of the Metropolitan Sewerage Commissioners to require at these connections automatic overflows and regulators, so designed as to act only when the intercepting sewer is filled to its maximum flow line. Maps, showing the details of the proposed connections as they are desired to be approved, are submitted herewith.

Your advice and approval is asked for these Hyde Park connections, as above outlined.

Subsequently, on Aug. 13, 1897, a similar application was received for the advice and approval of the Board concerning a proposed overflow from a fifteen-inch branch on the northerly side of the metropolitan sewer in Business Street, at the junction of Barry Place, Hyde Park.

Accompanying the applications were plans showing in detail the proposed connections with the proposed regulators and overflows. On each of these plans there is a note stating that the valve (by which the lateral sewer is shut off from the metropolitan) is designed to close when the metropolitan sewer is full.

It is understood that all the applications for connections with the metropolitan sewer in the Neponset valley thus far approved by your Board have been approved with the distinct understanding that no surface, roof or ground waters from under-drains should be admitted to the sewers, and that this provision applies to the connections mentioned in the applications submitted to this Board.

The sewage discharged from all of the overflows proposed in your applications would enter the fresh-water portion of the Neponset River, or Mother Brook, in the midst of a large and rapidly growing population, where the streams have a sluggish current on account of a dam below the outlets of the proposed overflows.

As stated in the previous reply relating to this matter, the Board believes it to be important to keep sewage from entering the fresh-water portion of the Neponset River, which, in the region in which it is proposed to make these overflows, is practically a mill pond; and that no opportunity should be afforded for the disposal of any sewage in this way unless it may be absolutely necessary in order to prevent the danger of a greater nuisance elsewhere.

The size of the metropolitan sewer above a point in the vicinity of the boundary line between Hyde Park and Boston was designed to be sufficient to remove all sewage of the district which it is intended to serve until about the year 1930, at which time it is expected that the population will be several times as great as that now living in this district. Below this point the size of the sewer is much smaller down to the place where it joins the Dorchester intercepting sewer, but was considered when planned to be sufficient to remove the sewage which the larger sewer will bring to it until about the year 1905, or possibly longer, depending upon the growth of the population and the increase in quantity of sewage in the district. The Dorchester intercepting sewer, into which the metropolitan sewer discharges, is provided with overflows through which the sewage may discharge into tide water automatically when the sewage in the Boston main drainage sewer rises above a certain height. It seems to the Board that the only condition which will

make the overflows proposed in your present application necessary would be a flow of sewage in the metropolitan sewer above the place where its size is reduced, much in excess of the capacity of the smaller sewer below the Hyde Park and Dorchester line, before the time that the high-level sewer is constructed.

No evidence has been submitted to show that the flow in the metropolitan sewer is likely to soon exceed the capacity of the sewer at any place, and it does not appear to the Board that it is necessary to provide at present automatic overflows for the proposed connections with the metropolitan sewer in Hyde Park ; and the Board, therefore, does not approve the construction of overflows as proposed in your application.

If observations made at times of maximum flow the height and flow of sewage in the metropolitan sewer, especially in the vicinity of the place where its size is contracted at the line between Hyde Park and Dorchester, shall show that the flow in the sewer is so great that there is danger that the capacity of the sewer, or any portion of it, is likely to be reached before any additional means of removing the sewage have been provided, and that the flooding of lateral sewers above the place where the sewer is contracted is threatened, or if from any other cause it would seem to you necessary to provide an overflow or overflows from the main sewer or its tributaries at any place, this Board will consider any information you may present showing the necessity or desirability of overflows, or any plans you may submit with regard to measures for disposing of the excess of sewage ; but, as already stated in the previous reply, the Board is desirous of avoiding the discharge of sewage into the Neponset River above any of the mill dams when not absolutely necessary.

By order of the Board, (Signed) SAM'L W. ABBOTT,
Secretary.

CONNECTIONS WITH THE METROPOLITAN SEWER ON THIS SYSTEM.

The following connections have been authorized with the metropolitan sewer on this system at this date (Oct. 1, 1898) : —

DATE AUTHORIZED.	City or Town.	Location of Connection.	Size.	Date of Completion.
July 10, 1897,	Boston,* . .	River Street, near Fremont Street,	15 inch,	July 13, 1897.
Sept. 3, 1898,	Boston,† . .	Near Spring Street (Parental School),	12 inch,	Aug. 14, 1898.
Sept. 3, 1898,	Boston,† . .	Weld and LaGrange streets, . .	12 inch,	Sept. 15, 1898.
May 14, 1898,	Boston,* . .	Near Idaho Street,	12 inch,	To be made.
May 21, 1898,	Boston,* . .	Adams and Butler streets, . .	12 inch,	July 18, 1898.
July 30, 1898,	Boston,* . .	Adams Street, near junction of Shawmut Bridge and Old Ne- ponset road,	15 inch,	To be made.
July 10, 1897,	Boston,* . .	River Street, near Fremont Street,†	15 inch,	July 13, 1897.
July 3, 1897,	Hyde Park, . .	Fairmount Avenue, between New England Railroad and Nepon- set River,	12 inch,	Aug. 6, 1897.
July 3, 1897,	Hyde Park, . .	Opposite extension of Milton Avenue, foot of Walter street,	18 inch,	To be made.
July 3, 1897,	Hyde Park, . .	Arlington Street, corner Metro- politan Avenue,	15 inch,	Aug. 6, 1897.
July 3, 1897,	Hyde Park, . .	Hyde Park Avenue, near Factory Street,	12 inch,	July 14, 1897.
July 10, 1897,	Hyde Park, . .	Hyde Park Avenue, near Factory Street,	20 inch,	To be made.
Aug. 11, 1897,	Hyde Park, . .	Corner Business Street and Barry Place,	15 inch,	Sept. 7, 1897.
Oct. 9, 1897,	Hyde Park, . .	Business Street, at Glenwood Street,	12 inch,	Sept. 27, 1898.
July 23, 1898,	Hyde Park, . .	Walnut Street, near New Eng- land Railroad,	8 inch,	Sept. 9, 1898.
Sept. 4, 1897,	Milton, . . .	Blue Hills Parkway,	12 inch,	To be made.
Nov. 20, 1897,	Milton, . . .	Adams Street,	8 inch,	Nov. 30, 1897.
July 23, 1898,	Milton, . . .	At Central Avenue,	15 inch,	Aug. 22, 1898.

* Dorchester.

† West Roxbury.

The expenditures upon the Neponset valley system for the year ending Sept. 30, 1898, have been \$212,861.71, which, with the amount already expended \$608,740.61, makes \$821,602.32 expended to date.

At the annual meeting of the Board, held, as provided in the act (chapter 439, Acts of 1889), on the first Monday in February (February 5), Hosea Kingman of Bridgewater was again chosen chairman and Edward P. Fisk of Boston clerk for the year.

Owing to the ill health of the clerk, Mr. Edward P. Fisk, the Board, believing that a leave of absence for rest and recuperation would be of benefit to him, passed, at his request, the following vote, at the meeting of May 28, 1898 :—

Voted, To grant the clerk, Edward P. Fisk, four months' leave of absence, beginning June 1, 1898, he to receive no compensation meantime ; and during such absence Herbert E. Brayton is hereby selected and appointed acting clerk of this Board.

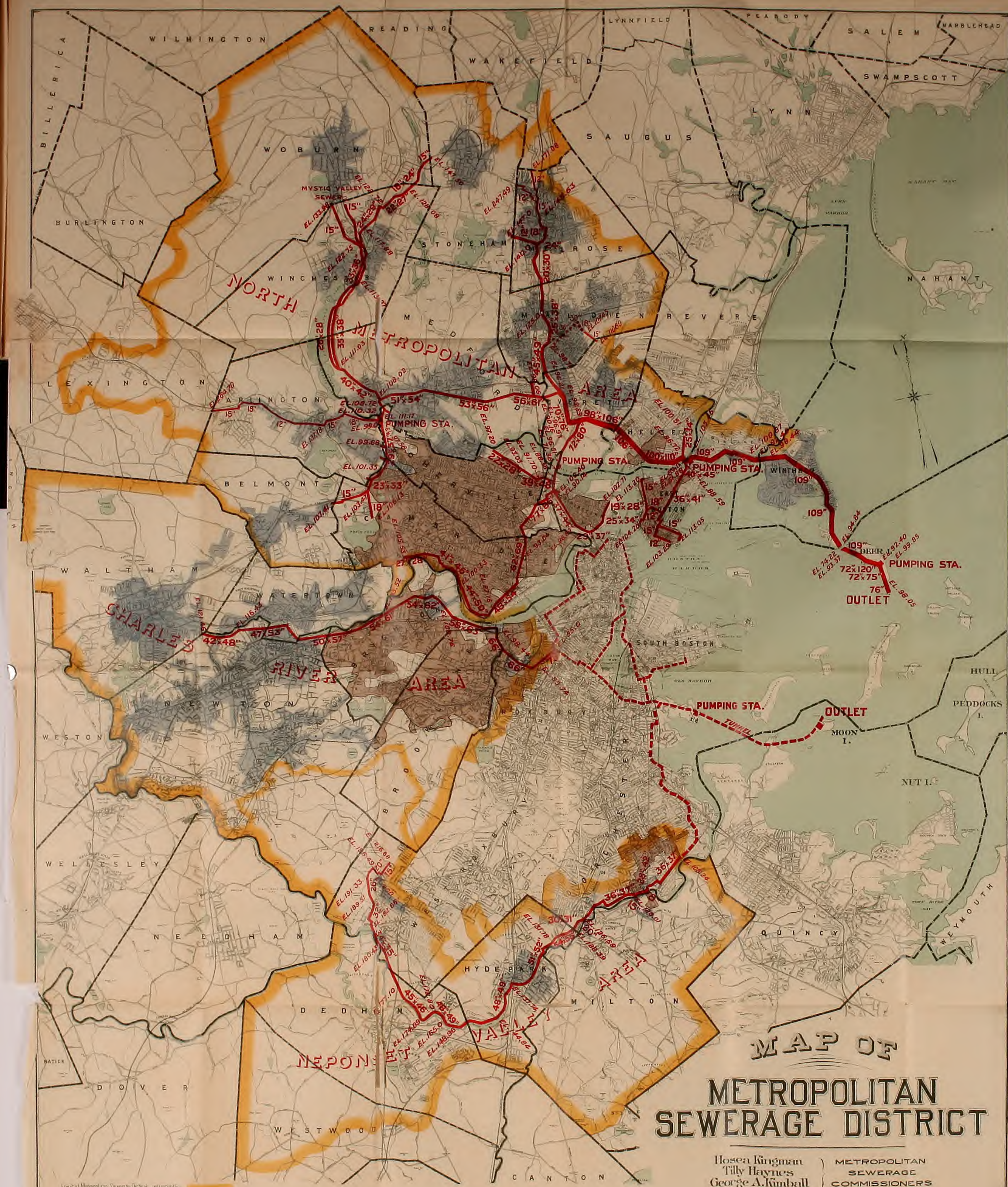
At the meeting of the Board held Jan. 8, 1898, Mr. George A. Kimball of Somerville, appointed as his own successor upon this Board, presented his commission and took his seat as a member of this Board for the new term.

The Board recommends the appropriation of the sum of \$15,000 on the Neponset valley system, for outstanding bills, amounts due and claimed by contractors, and in settlement of land damages.

The Appendix contains tables, showing in detail the receipts and expenditures for the year, also the assets and liabilities to date.

HOSEA KINGMAN,
TILLY HAYNES,
GEORGE A. KIMBALL,
Metropolitan Sewerage Commissioners.

Boston, Oct. 1, 1898.



Limit of Metropolitan Sewerage District indicated thus: Completed Metropolitan Sewers and Metropolitan Sewers under construction indicated thus: Portion of Malden Sewerage System to be absorbed indicated thus: Boston Main Drainage Sewers indicated thus: Areas Served by Combined System and contributing Sewage to Metropolitan Sewers to date shaded thus: Areas Served by Separate System and contributing Sewage to Metropolitan Sewers to date shaded thus:

Elevations are referred to a datum which is 100 feet below mean low water at Boston Harbor and 100 feet below Boston City Base.

AREAS OF SEWERAGE DISTRICT	
NORTH METROPOLITAN AREA	78 Sq. Miles.
CHARLES RIVER AREA	48 Sq. Miles.
NEPONSET VALLEY AREA	44 Sq. Miles.
TOTAL AREA INCLUDING WATER SURFACES	164 Sq. Miles.

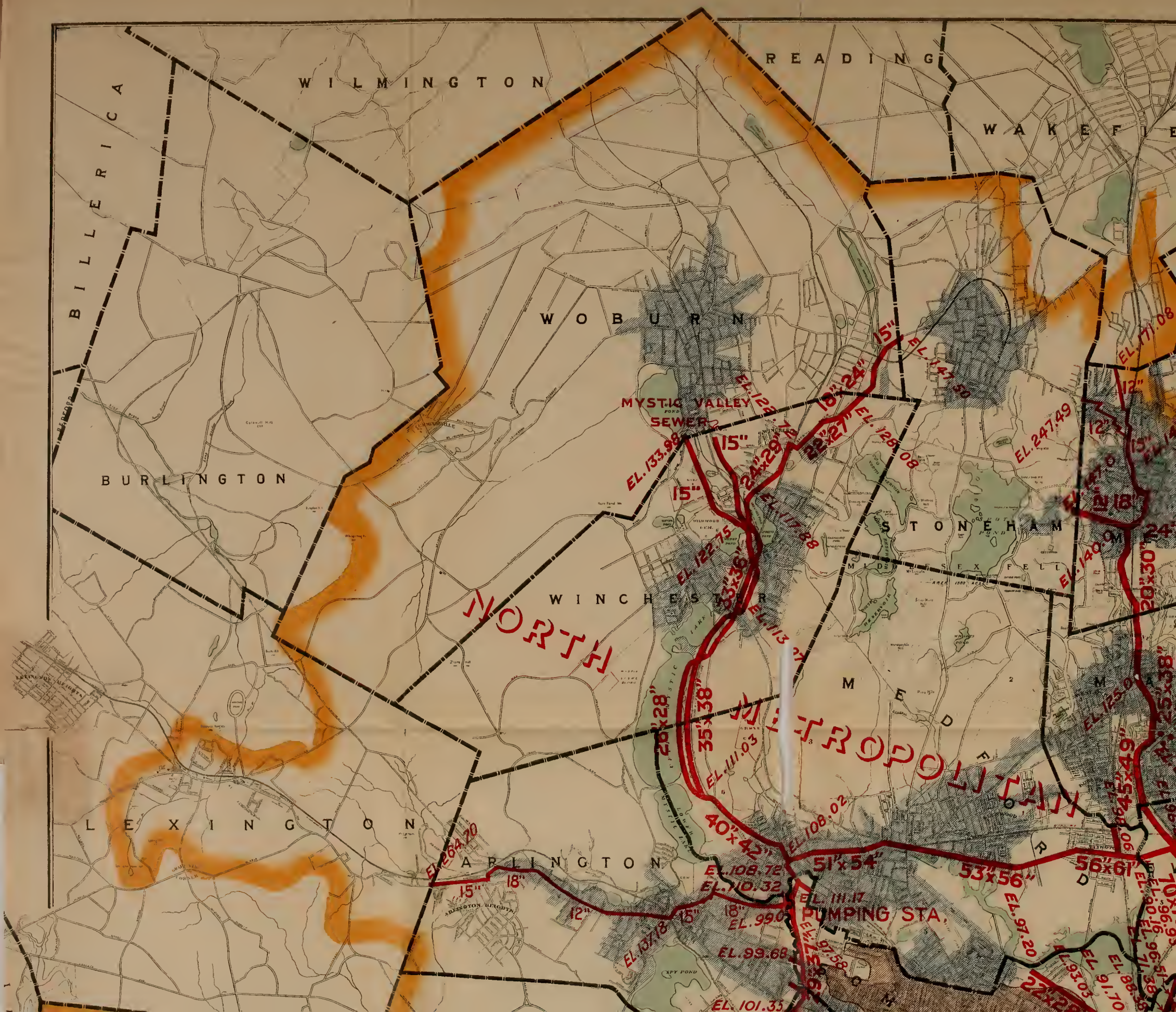
MAP OF METROPOLITAN SEWERAGE DISTRICT

Hosea Kingman
Tilly Haynes
George A. Kimball
Wm. M. Brown Jr. CHIEF ENGR.

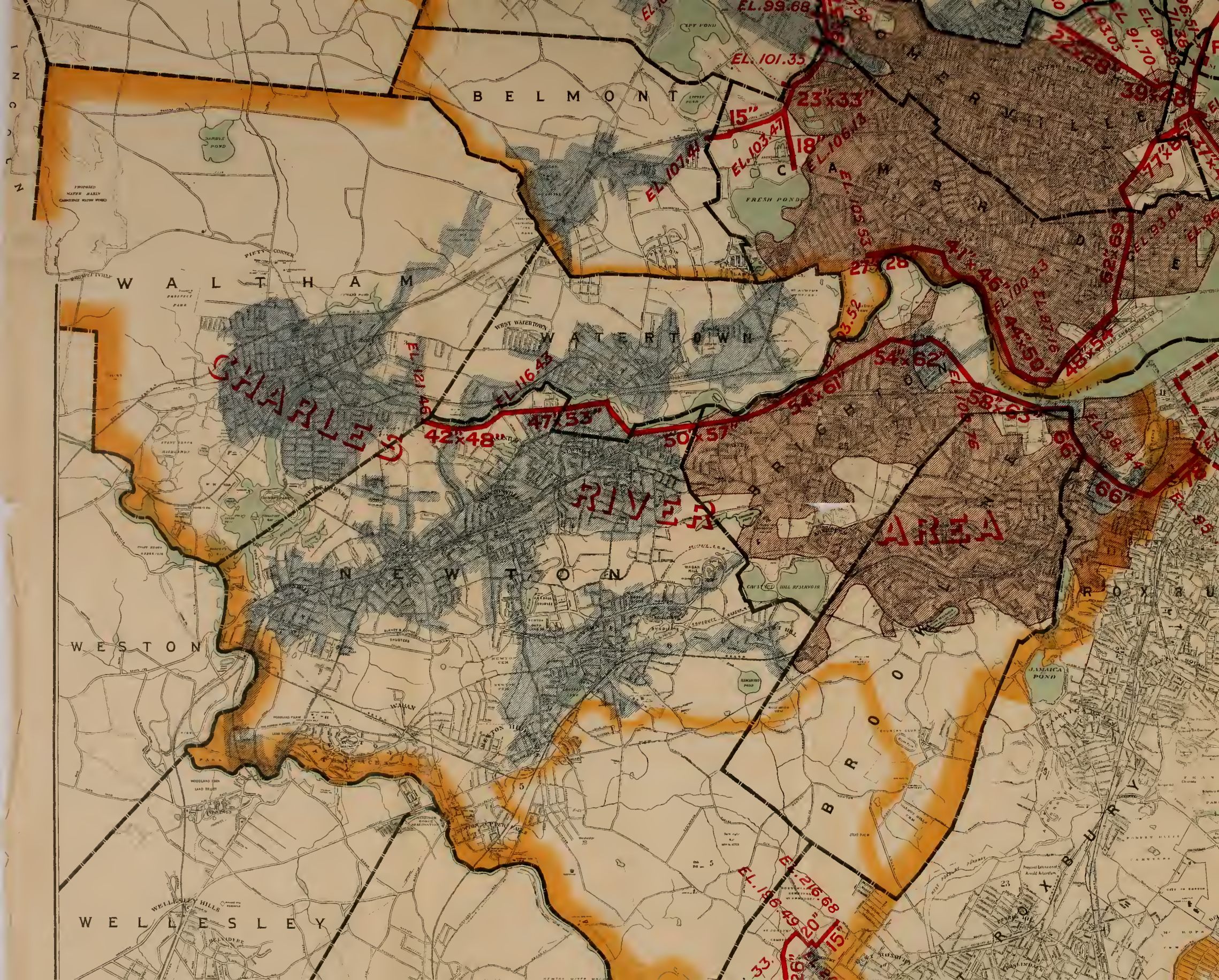
METROPOLITAN
SEWERAGE
COMMISSIONERS

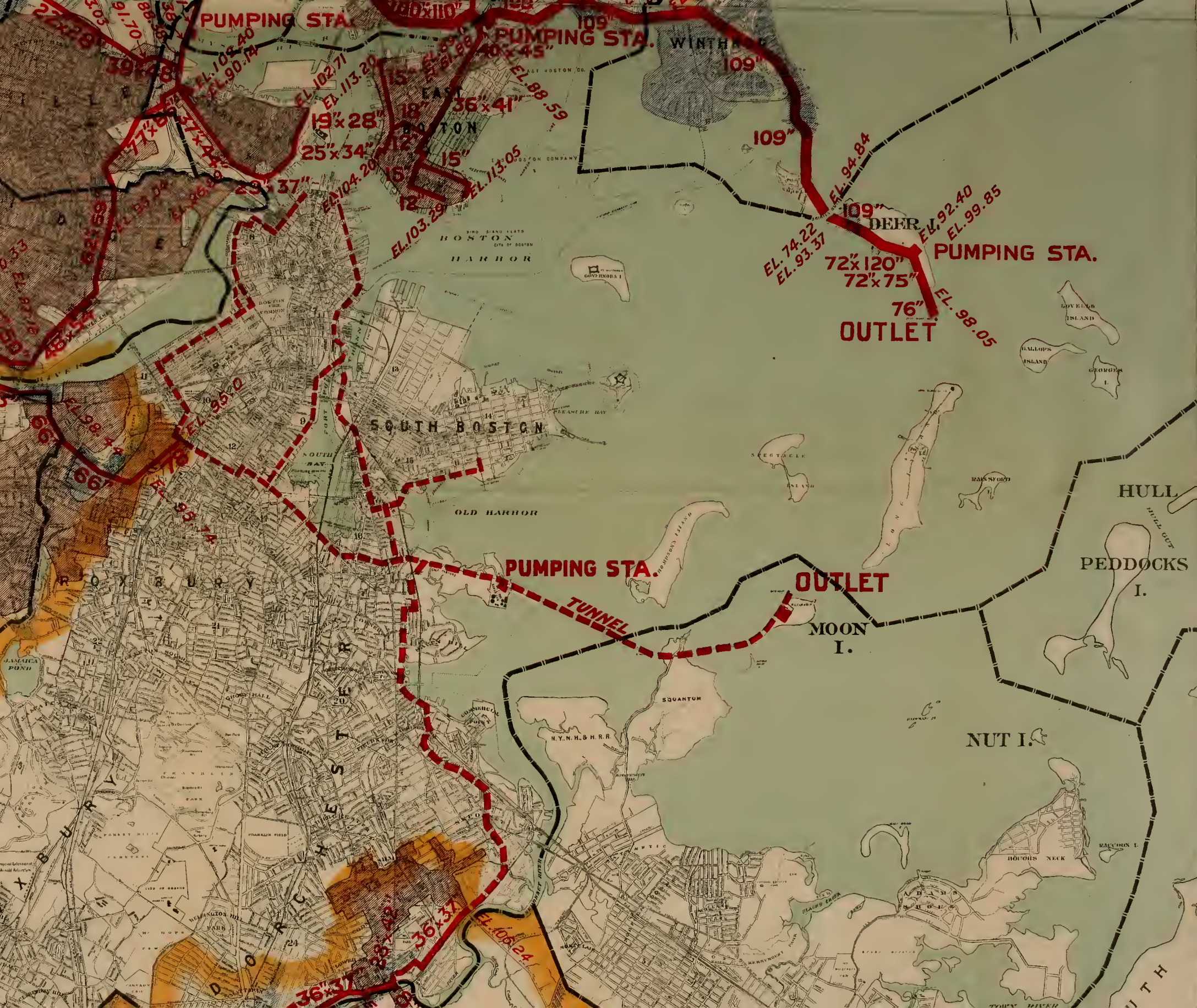
BOSTON, MASSACHUSETTS, SEPT. 30, 1898.

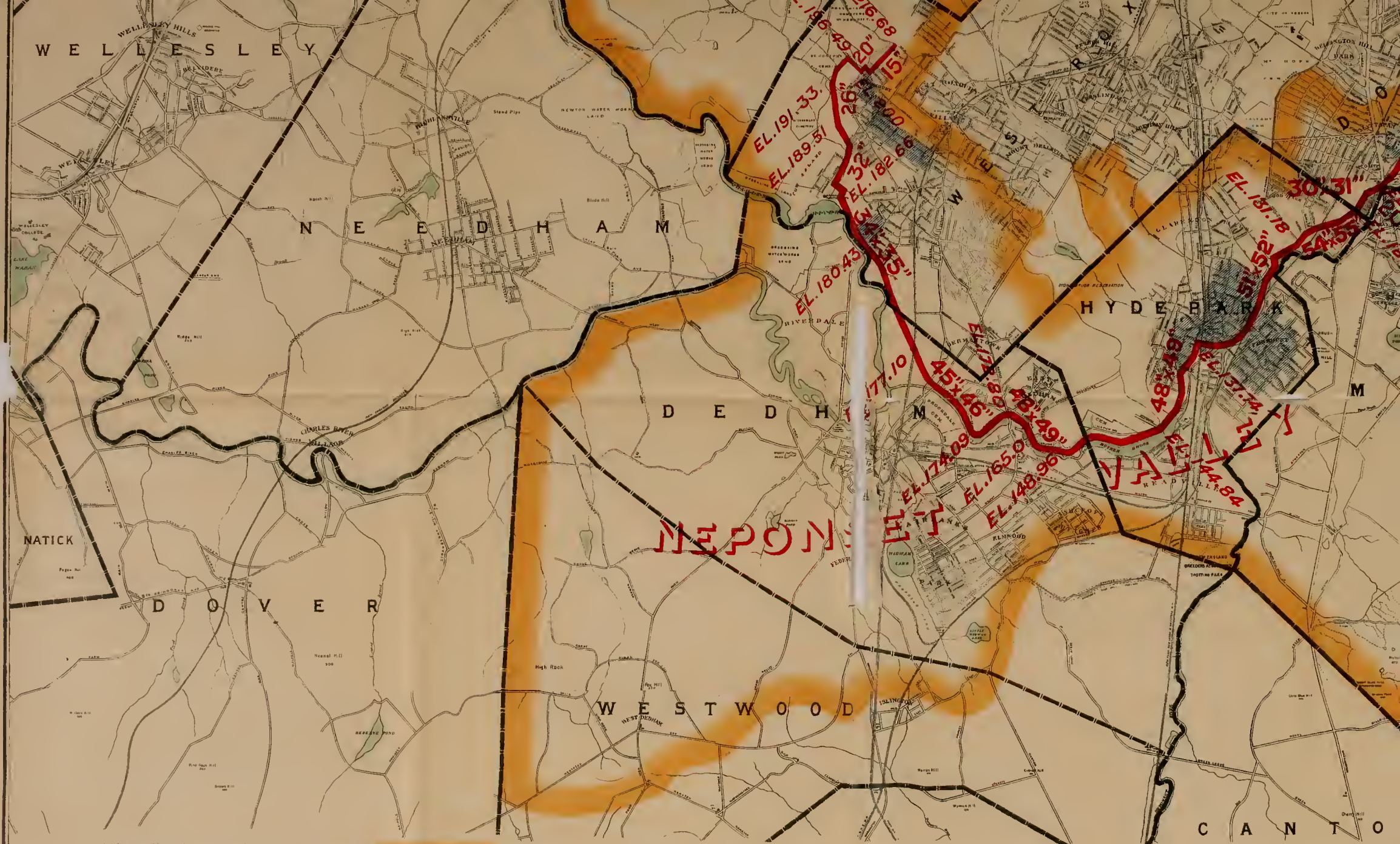












Limit of Metropolitan Sewerage District indicated thus

Completed Metropolitan Sewers and

Metropolitan Sewers under construction indicated thus

Portion of Malden Sewerage System

to be acquired indicated thus

Boston Main Drainage Sewers indicated thus

Areas Sewered by Combined System

and contributing sewage to Metropolitan

Sewers to date shaded thus

Areas Sewered by Separate System

and contributing sewage to Metropolitan

Sewers to date shaded thus

Elevations are referred to a datum which is 100 ⁸⁴/₁₀₀ feet below mean low water of Boston Harbor and 100 feet below Boston City Base.

AREAS OF SEWERAGE DISTRICT.

NORTH METROPOLITAN AREA 78 SQ. MILES.

CHARLES RIVER AREA 42 SQ. MILES.

NEPONSET VALLEY AREA 44 SQ. MILES.

TOTAL AREA INCLUDING
WATER SURFACES 164 SQ. MILES.



MAP OF METROPOLITAN SEWERAGE DISTRICT

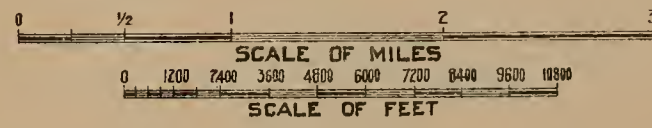
Hosea Kingman
Tilly Haynes
George A. Kimball } METROPOLITAN
SEWERAGE
COMMISSIONERS

Wm. M. Brown Jr. CHIEF ENGR.

AREAS OF SEWERAGE DISTRICT.

METROPOLITAN AREA	78	SQ. MILES.
RIVER AREA	42	SQ. MILES.
T VALLEY AREA	44	SQ. MILES.
AREA INCLUDING ER SURFACES	164	SQ. MILES.

BOSTON, MASSACHUSETTS, SEPT. 30, 1898.



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REPORT OF CHIEF ENGINEER

AND

SUPERINTENDENT.

REPORT OF CHIEF ENGINEER

AND

SUPERINTENDENT.

Boston, Sept. 30, 1898.

HOSEA KINGMAN, TILLY HAYNES, GEO. A. KIMBALL,
Metropolitan Sewerage Commissioners.

GENTLEMEN : — The following report concerning the metropolitan sewerage system during the year ending Sept. 30, 1898, is respectfully submitted.

The present metropolitan sewerage district embraces an area of about 164 square miles. It includes part of the city of Boston, the whole territory of 13 municipalities and parts of 8 other municipalities, all in the vicinity of Boston. Its outline is shown on the general map which accompanies this report. The district is divided into three general systems of metropolitan sewers, whose aggregate length now amounts to about 69 miles.

The north metropolitan system consists of a series of intercepting sewers which receives the sewage from the local sewers of Woburn, Stoneham, Winchester, Arlington, Belmont, Somerville, Cambridge, Medford, Melrose, Malden, Everett, Chelsea, Charlestown, East Boston and Winthrop. Its most distant point is about 18 miles from its outlet at Deer Island.

The Charles River valley system is an intercepting sewer which is situated near the southerly bank of the Charles River. It receives the sewage from the local sewers of Waltham, Watertown, Newton, Brighton, Brookline and a part of the Back Bay district in Boston. It now discharges into the main intercepting sewer of the Boston main drainage works, which are owned and operated by the city of Boston.

The Neponset valley system is an intercepting sewer which is situated near the Neponset River and Mother Brook. It receives the sewage from the local sewers of parts of West Roxbury, Dedham, Hyde Park, Milton and part of Dorchester. Eventually it

will also receive sewage from districts in the southerly parts of Brookline and Newton. It now connects with the Dorchester intercepting sewer, a branch of the Boston main drainage.

TABLES GIVING LENGTH AND SIZES OF METROPOLITAN SEWERS TO
SEPT. 30, 1898.

The following tables contain some information concerning the position, lengths and sizes of the metropolitan sewers : —

NORTH METROPOLITAN AREA.

*Table showing Locations, Lengths and Sizes of Metropolitan Sewers within the North Metropolitan Area, and the Number of Public and Special Connections made with the System in Each City and Town.**

CITY OR TOWN.	Size of Sewers.	Length in Miles.	Public Connections, Sept. 30, 1898.	SPECIAL CONNECTIONS.	
				Character or Location of Connection.	Number in Operation.
Boston : —					
Deer Island,	6' 3" to 9',	1.367	2	- -	-
East Boston,	9' to 1',	5.467	15	- -	-
Charlestown,	6' 7"×7' 5" to 1', . .	3.292	8	Navy Yard, . .	1
Winthrop, .	9',	2.864	4	- -	-
Chelsea, . .	8' 4"×9' 2" to 2' 1"×2' 10",	2.212	3	Rendering works, . Metropolitan Water Board, blow-off. Metropolitan Water Board, blow-off. Metropolitan Water Board, blow-off.	} 2 } 1 } 1
Everett, . .	8' 2"×8' 10" to 4' 8"×5' 1",	2.925	2		
Malden, . .	3' 9"×4' 1" to 1' 3", . .	2.150	4		
Melrose, . .	1' 10"×2' 9" to 10", . .	3.843†	13	Private houses on sewer purchased from town of Melrose.	15
Cambridge, .	5' 2"×5' 9" to 1' 3", . .	5.963	17	Slaughter-house, .	1
Somerville, .	6' 5"×7' 2" to 1' 10"×2' 3",	3.471	6	Slaughter-houses(3),	1
Medford, . .	4' 8"×5' 1" to 10", . .	5.359	16	Private houses, .	4
Winchester, .	2' 11"×3' 3" to 1' 3", . .	6.403	8	Tannery,	2
Stoneham, . .	1' 3" to 10",	0.010	2	- -	-
Woburn, . .	1' 10"×2' 4" to 1' 3", . .	0.933	3	Glue factory, . .	1
Arlington, . .	1' 6" to 10",	3.367‡	4	- -	3
Belmont, . .	- -	-	1	- -	-
Wakefield, . .	- -	-	-	- -	-
		49.626§	108		32

* The metropolitan sewer extends but a few feet into the towns of Belmont and Wakefield.

† This includes .736 of a mile of sewer purchased from the town of Melrose.

‡ This includes 2.631 miles of sewer purchased from the town of Arlington.

§ This includes 2.7 miles of Mystic valley sewer in Medford, Winchester and Woburn running parallel with the metropolitan sewer.

CHARLES RIVER AREA.

Table showing Locations, Lengths and Sizes of Metropolitan Sewers within the Charles River Valley Area, and the Number of Public and Special Connections made with the System in Each City and Town.

CITY OR TOWN.	Size of Sewers.	Length in Miles.	Public Connections, Sept. 30, 1898.	SPECIAL CONNECTIONS.	
				Character or Location of Connection.	Number in Operation.
Part of Boston proper.	6' 6" to 5' 6", . . .	1.500	8	Administration building, Boston Park Department.	1
Boston (Brighton).	5' 6" to 4' 2"×4' 9", . .	3.688	10	Abattoirs, . . .	3
Brookline, . .	5' 6",	0.127	1	- -	-
Newton, . .	4' 2"×4' 9" to 3' 6"×4', .	2.057	6	Private houses, . .	2
Watertown, . .	4' 2"×4' 9" to 3' 11"×4' 5",	0.725	5	Factory, . . .	1
Waltham, . .	3' 6"×4',	0.001	1	- -	-
		8.098	31		7

NEPONSET VALLEY AREA.

Table showing Locations, Lengths and Sizes of Metropolitan Sewers within the Neponset River Valley Area, and the Number of Public and Special Connections made with the System in Each City and Town.

CITY OR TOWN.	Size of Sewer.	Length in Miles.	Number of Public Connections.	SPECIAL CONNECTIONS.	
				Character or Location of Connection.	Number in Operation.
Milton, . . .	1' 8" to 8",	0.05	3	- -	-
Boston (Dorchester), . .	3'×4' to 2' 6"×2' 7", . .	2.87*	4	- -	-
Hyde Park, . .	4' 6"×4' 7" to 4'×4' 1", . .	3.09	8	- -	-
Dedham, . . .	4'×4' 1" to 3' 9"×3' 10", .	2.35	-	- -	-
Boston (West Roxbury), . .	3' 9"×3' 10" to 1', . . .	2.94	-	Parental school, . .	1
		11.30	15		1

* This includes 1 24 miles of sewer purchased from the city of Boston.

The cost of these metropolitan sewers to date, including pumping stations, siphons and appertaining structures, is given below :—

50 miles north metropolitan system,	\$5,116,695 63
8 miles Charles River valley system,	789,134 27
11 miles Neponset valley system,	821,602 32

Total cost of 69 miles of metropolitan sewers to Sept.

30, 1898, \$6,727,432 22

According to the last annual report of the Board, there were 63.8 miles of metropolitan sewers on Sept. 30, 1897. There have been added, therefore, during the year about 5.2 miles of sewers. This addition includes 1.3 miles of new sewers constructed during the year in Arlington, Malden and Melrose. These are given in the following table :—

NUMBER OF SECTION.	Location.	Size (Inches).	Length (Linear Feet).
Section 50,	Melrose,	15 and 12	955
Section 51,	Melrose,	10	899
Section 53,	Arlington,	18 and 15	3,700
Section 55,	Malden,	15	1,548
Total,		7,102 feet = 1.3 miles.	

The remainder of the 5.2 miles added during the year is made up of the local sewers purchased of the town of Arlington and of the city of Boston in the Neponset valley. These are given in the following table :—

Table showing Locations, Length and Sizes of Sewers purchased during the Year from Sept. 30, 1897, to Sept. 30, 1898, from the Town of Arlington, authorized by Chapter 520 of the Acts of 1897, and known as Section 52 of the Metropolitan Sewerage System.

LOCATION.	Diameter (Inches).	Length (Linear Feet).	Material.
Decatur Street,	18	1,718.6	Pipe.
Private land, River Street to Park Street, . . .	18	761.7	Pipe.
Coral Street,	18	317.4	Pipe.
Private land, Coral Street to Franklin Street, . .	18	803.7	Pipe.
Franklin Street,	18	471.0	Pipe.
Lewis Avenue,	18	777.2	Pipe.
Medford Street,	18	425.6	Pipe.
Chestnut Street,	15	605.1	Pipe.
Mystic Street,	12	571.4	Pipe.
Massachusetts Avenue,	12	7,440.1	Pipe.
Total length, 13,892 feet = 2.63 miles.			
Regulators and overflow at Decatur Street and 63 man-holes.			
For this sewer \$40,000 has been paid to the town of Arlington on account.			

Table showing Locations, Lengths and Sizes of Sewers purchased during the Year from Sept. 30, 1897, to Sept. 30, 1898, from the City of Boston, authorized by Chapter 406 of the Acts of 1895, and now known as Sections 9, 10 and 11 of the Neponset Valley System.

LOCATION.	Size.	Length (Linear Feet).
Through private land from Granite Avenue to Butler Street,	3'×4',	3,307
Butler Street,	3'×4',	447
Adams Street,	3'×4',	1,022
Washington Street,	3'×4',	403
Private land, Washington Street to Central Avenue,	2' 4"×3' 6",	1,374
Total length, 6,553 feet = 1.2 miles.		
Twenty man-holes.		
For this sewer \$100,000 has been paid to the city of Boston.		

Estimates are given below of the total populations at present residing within the metropolitan areas, the populations contributing sewage, and other data, showing to what extent the metropolitan sewers are now used : —

Table giving Details of Areas, Estimated Resident Population within Area, Estimated Populations contributing Sewage, Miles of Local Sewers connected with Metropolitan Sewers and Number of Connections.

North Metropolitan System.

Area (Square Miles).	Estimated Total Population.	Miles of Local Sewer connected.	Estimated Population contributing Sewage.	Ratio of Contributing Population to Total Population.	CONNECTIONS MADE WITH METROPOLI- TAN SEWERS.	
					Public.	Special.
77.93	408,200	412.87	274,430	Per Cent. 67.2	108	32

Charles River Valley.

42.06	112,400	250.67	73,447	65.3	31	7
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Neponset Valley.

44.27	34,700	25.78	6,355	18.3	15	1
164.26	555,300	689.32	354,232	63.8	154	40

It appears from this table that there are at present about 555,000 persons residing on the metropolitan sewerage districts, which

comprise 164 square miles ; also that about 354,000 persons, or about 64 per cent., of this population are now contributing sewage to the metropolitan sewers ; and that there are about 689 miles of local sewers owned by the several cities and towns which are connected with the metropolitan interceptors by means of 154 public and 40 special connections.

It seems probable, from a comparison of these figures with estimates given in the ninth annual report of the Board, that during the present year the residential population in the metropolitan sewerage districts has increased about 30,000 ; that the population contributing sewage has increased 94,000 ; that 93 miles of local sewers have been added to the amount connected a year ago ; and that 45 public and 18 special connections have been made with the system.

The average daily amount of sewage pumped during the year ending Sept. 30, 1898, and also the preceding year, at the pumping stations of the north metropolitan system are given in the following table :—

PUMPING STATION.	AVERAGE DAILY PUMPAGE.		
	Year ending Sept. 30, 1897.	Year ending Sept. 30, 1898.	Increase.
Deer Island,	Gallons. 31,853,000	Gallons. 41,100,000	Gallons. 9,247,000
East Boston,	29,899,000	38,700,000	8,801,000
Charlestown,	20,658,000	24,800,000	4,142,000
Alewife Brook,	2,538,000	3,176,000	638,000

It was mentioned in the report of last year that the average daily service at Deer Island was approaching the capacity of a single pump, and that it was expected that the large increase to be made in the tributary districts in East Boston, Chelsea and Charlestown would bring the service fully up to the capacity of a single pump. This would make necessary the constant operations of both pumps at each station during storms and the larger flows of winter. It was, therefore, recommended that preparation be made for the installation of a third pumping plant at each of the three stations. Some work has been done at each of the pumping stations during the year in preparation for these additional pumping plants.

Pursuant to the directions and provisions of chapter 4 of the Resolves of 1898, surveys and investigations for the report upon a high-level system of sewerage for the Charles and Neponset valleys have been commenced and are now well advanced.

Work has also been done during the year in extending and perfecting the sewers in the north metropolitan and Neponset valley systems.

A detailed statement concerning the work of construction undertaken during the year follows :—

DETAILED STATEMENT RELATING TO CONSTRUCTION ON THE NORTH METROPOLITAN SYSTEM DURING THE YEAR ENDING SEPT. 30, 1898.

Chapter 414 of the Acts of 1896 and chapters 86 and 436 of the Acts of 1897 authorized the extension of the metropolitan sewers through the town of Melrose to the southerly line of the town of Wakefield at Greenwood Street, to provide an outlet for the sewage of about 600 acres in that town ; and an extension to the east line of the town of Stoneham at Franklin Street, to provide an outlet for the sewage from about 1,000 acres in that town which can be most conveniently drained through Melrose.

These extensions comprised the purchase of about three-quarters of a mile of the trunk sewer of the local system of Melrose, and the construction of two branch lines from this sewer. One of these lines consists of a small brick and pipe sewer about a mile in length, to Wakefield, which is known as Section 50 of the metropolitan sewer. The other consists of a pipe sewer, about four-fifths of a mile in length, to Stoneham, which is known as Section 51 of the metropolitan sewer. The local sewer of Melrose was purchased last year, and the details of this purchase are given in the ninth annual report, page 4.

Of the extension to Wakefield and Stoneham, 1,853 lineal feet were completed early during the present year.

The total expenditure thus far on account of these sections is as follows :—

Wakefield branch, Section 50,	\$20,606 45
Stoneham branch, Section 51,	11,567 38
Sewer purchased from the town of Melrose,	15,000 00
Total,	<u>\$47,173 83</u>

The details of the completed section are given below :—

SECTION 50 (WAKEFIELD BRANCH), MELROSE AND WAKEFIELD.

Location. — From a point at the junction of Lake Avenue and Tremont Street extending to the junction of Tremont and Melrose streets; thence to the junction of Melrose and Belmont streets (passing under the stone arch bridge of the Boston & Maine Railroad); thence to the junction of Belmont and Franklin streets; thence to a point on Greenwood Street at the Melrose and Wakefield town line.

Assistant Engineer in Charge. — Frank I. Capen.

Contractors. — John Booth Company.

Length (Feet).	Size.	Average Cut (Feet).	Approximate Cost per Linear Foot.	Remarks.
250	18' pipe,	11.0	\$2 05	-
1,330	18" × 20", brick.	9.0	3 05	This cost included about 600 linear feet pile foundation.
2,005	15", .	12.0	3 50	This includes 590 cubic yards rock excavation.
1,078	12", .	18.0	4 57	This includes 598 cubic yards rock excavation.
4,663	-	-	\$4 42*	Includes engineering inspection and miscellaneous supplies.

* Average.

Character of Excavation. — From Lake Avenue for 200 feet, sand and gravel; for the next 650 feet past the pond, the excavation was in peat. For the remainder of the distance to near the junction of Melrose and Tremont streets the excavation was in sand and gravel, except for about 200 feet in crossing a swamp where there was peat. From near the junction of Tremont and Melrose streets to within 550 feet of the end of the section the excavation was in sand and gravel with rock below. In the last 550 feet the excavation was in sand and gravel.

SECTION 51 (STONEHAM BRANCH), MELROSE AND STONEHAM.

Location. — From a point in Tremont Street, Melrose, about 1,500 feet north of Lake Avenue, extending through private lands, Brunswick Way, Brunswick Park, Vinton and Melrose streets and Franklin Terrace to a point in Franklin Street, Stoneham, about 1.33 feet beyond the Melrose and Stoneham town line.

Assistant Engineer in Charge. — Frank I. Capen.

Contractors. — A. W. Bryne Construction Company.

Length (Feet).	Size.	Average Cut (Feet).	Approximate Cost per Linear Foot.	Remarks.
3,148	12", .	9.5	\$2 20	Includes 275 cubic yards rock excava- tion
976	10", .	12.0	3 49	Includes 310 cubic yards rock excava- tion.
4,124	-	-	\$2 81*	Includes engineering, inspection and miscellaneous supplies.

* Average.

Character of Excavation. — The excavation for the first 2,750 feet to the end of Melrose Street extension was in sand and gravel except for about 100 feet which extended below grade. Through Franklin Terrace and Franklin Street the excavation was in hard pan and rock for the larger part of the distance.

Chapter 520 of the Acts of 1897 authorized the extension of the metropolitan sewers through the town of Arlington to the easterly line of the town of Lexington at Massachusetts Avenue, to provide an outlet for the sewage from about 5 square miles of that town.

This extension comprised the purchase of about 2.6 miles of the trunk sewers of the local system of the town of Arlington, and the construction of a branch line from this sewer consisting of about 0.85 of a mile of pipe sewer in Arlington, which is known as Section 53 of the metropolitan sewer.

The local sewer was purchased on Sept. 17, 1898. The details of the purchase are given on page 6 of this report.

The extension is now under contract, and about 3,700 lineal feet have been completed.

The total expenditure to date is as follows :—

Section 52, paid to the town of Arlington on account,	\$40,000 00
Paid to Long & Little, contractors, and for inspection and supplies,	16,583 69
Total,	<u>\$56,583 69</u>

The following is a detailed statement of the work done on this section :—

SECTION 53 (LEXINGTON BRANCH), ARLINGTON AND LEXINGTON.

Location.—From a point at the junction of Massachusetts Avenue and Lowell Street, through Lowell Street to near the Lexington branch of the Boston and Maine railroad, thence within and parallel to the railroad location to Park Avenue, through Park Avenue to Massachusetts Avenue, thence through Massachusetts Avenue to the Lexington town line.

Assistant Engineer in Charge.—Frank I. Capen.

Contractors.—Long & Little.

Length (Feet).	Size.	Average Cut (Feet).
4,510 58	18" and 15", :	11.25

Length completed to Oct. 1, 1898, 3,700 feet.

Average cost per lineal foot to Oct. 1, 1898, \$4.86.

This includes 2,000 cubic yards rock excavation and about 200 lineal feet pile foundation.

Character of Excavation.—From Massachusetts Avenue in Lowell Street for about 600 feet, gravelly clay with rock below; for the next 300 feet across the brook valley, filling; for the next 1,500 feet to 400 feet beyond Park Avenue on Massachusetts Avenue, clayey gravel with rock below to grade, except for a short interval where no rock was found. For the next 200 feet on Massachusetts Avenue the excavation was in filling with peat below to grade, a pile foundation being required. For the next 1,100 feet on Massachusetts Avenue to near Vine Street the excavation was in sand and gravel. For the remainder of the section the excavation completed to date was in sand and gravel with rock below, and was about 200 feet in length.

Chapter 215 of the Acts of 1898 authorized the extension of the metropolitan sewer through the city of Malden to the westerly boundary of the city of Everett, to provide an outlet for the

sewage from about 165 acres in Everett which are naturally drained through Malden. The act authorized the purchase of about 1 mile of the local sewer of the city of Malden, extending from the junction of Middlesex and Charles streets through Charles Street, Main Street, Eastern Avenue and Bryant Street to Cross Street, and the construction of an extension from this sewer of about 0.3 of a mile of pipe sewer in Malden, which is known as Section 55 of the metropolitan sewer.

The total expenditure to date is \$4,574.73.
The local sewer has not yet been purchased from the city of Malden.
The extension was completed in July of this year.
A description of the work done on this section follows : —

SECTION 55 (EVERETT BRANCH), MALDEN AND EVERETT.

Location. — From junction of Cross and Bryant streets southerly on Bryant Street to the Everett and Malden boundary line.
Assistant Engineer in Charge. — Frank I. Capen.
Contractors. — A. W. Bryne Construction Company.

Length (Feet).	Size.	Average Cut (Feet).	Approximate Cost per Linear Foot.
1,548	15",	9.5	\$3 04

Character of Excavation. — For the first 700 feet the excavation was in peat with sandy clay to below grade. For the remainder of the section the excavation was in sand with clayey sand below to grade.

Additional Pumping Plant.

The work done during the year in preparation for the additional pumping plant is as follows : —

Day work : —
Assistant Engineer in Charge. — Frank I. Capen.
Foreman. — Henry J. Wright.

At the Charlestown station considerable work has been accomplished in preparing for additional pumping plant. The enlargement of the third discharge tube is completed. The work in the deep suction man-hole is finished, the boiler foundations have been built and weighted, and some of the excavation for the basement at the northerly end of the engine house has been made.

The total expenditure on the work to date has been \$5,620.26.

DETAILED STATEMENT RELATING TO CONSTRUCTION ON THE NEPONSET VALLEY SYSTEM DURING THE YEAR ENDING SEPT. 30, 1898.

Chapter 406 of the Acts of 1895 authorized the Board of Metropolitan Sewerage Commissioners to extend the Dorchester intercepting sewer of the city of Boston from Central Avenue in Dorchester, through Dorchester, Hyde Park, Dedham and West Roxbury to Brookline, and to acquire so much of the Dorchester intercepting sewer as the city of Boston had built above Granite Avenue at that date.

To meet the expenses incurred under the act a first appropriation of \$500,000 was authorized.

During the year ending Sept. 30, 1896, 7 miles of this main sewer, known as the Neponset valley interceptor, extending from Central Avenue in Dorchester to the Dedham branch of the New York, New Haven & Hartford Railroad in Dedham, near Mother Brook, was placed under contract.

Chapter 83 of the Acts of 1897 provided an additional appropriation of \$300,000 for further construction in the Neponset valley, and chapter 180 of the Acts of 1898 made a new appropriation of \$35,000.

During the year ending Sept. 30, 1897, contracts were executed for the remainder of this system, extending through West Roxbury to Weld Street, near Brookline. At the above date the whole system had been completed excepting for a length of 4,864 feet in Dedham and West Roxbury, where the work was only partially finished at that time. This length, however, had been included in the list of metropolitan sewers completed during that year. This length of 4,864 feet of partially completed sewer was finished early in the present year, and, as it forms part of sections 26 and 27 of the Neponset valley system, a detailed statement in relation to the whole of these sections is given below.

The total cost of construction on the Neponset valley system to date has been \$821,602.32.

The Dorchester interceptor, from Granite Avenue to Central Avenue, was purchased from the city of Boston Jan. 15, 1898, for \$100,000, and since that date has been operated as a part of the metropolitan system.

SECTION 26 (NEPONSET VALLEY SYSTEM), DEDHAM AND WEST
ROXBURY.

Location.— From a point in Dedham about 1,500 feet northerly from Mother Brook and about 100 feet north-westerly from the Dedham branch of the New York, New Haven & Hartford Railroad, extending through private lands, near the Charles River, to Spring Street, West Roxbury, a total distance of 4,070 feet.

Assistant Engineer.— C. Barton Pratt.

Contractor.— The National Contracting Company of New York.

Excavation.

	3 Feet 9 Inches by 3 Feet 10 Inches Sewer.	2 Feet 10 Inches by 2 Feet 11 Inches Sewer.
Length of trench (feet),	2,246	1,824.2
Average depth of trench excavation to bottom of underdrain (feet),	17.1	16.0
Greatest depth of trench excavation to bottom of underdrain (feet),	23.3	22.0
Average width at top of trench (feet),	8.3	6.8
Average width at bottom of trench (feet),	6.5	6.1
Volume of trench excavation per lineal foot (cubic yards), . .	4.9	4.1
Approximate cost of trench per lineal foot, including sheeting left in, excavation and refilling below masonry, etc.	\$7 20	\$6 00

Masonry.

Contract prices :—

Brickwork, American cement mortar, per cubic yard,	\$11 45
Brickwork, Portland cement mortar, per cubic yard,	13 45
Concrete, American cement mortar, per cubic yard,	4 90
Concrete, Portland cement mortar, per cubic yard,	6 50
Cost of masonry per linear foot of trench, including underdrain, tarred paper, etc., to date :—	
For sewer 3 feet 9 inches by 3 feet 10 inches,	5 72
For sewer 2 feet 10 inches by 2 feet 11 inches,	3 78
Cost of section per linear foot for excavation and masonry, labor, materials, inspection and miscellaneous items,	11 96

Character of Excavation.— The excavation was generally in marsh lands, near the Charles River, from the beginning of the section to within about 400 feet of Spring Street, consisting of a fine wet sand and gravel with clay, overlaid with peat, for a distance of about 3,400 feet. Near the middle of the section the peat extended below the sewer, and for a length of 235 feet a pile foundation was built. For a length of about 400 feet near Spring Street the excavation was largely through ledge.

Work was begun upon this section June 24, 1897, and was finished on Feb. 1, 1898. The amount paid the contractor was \$46,311.42.

SECTION 27 (NEPONSET VALLEY SYSTEM), WEST ROXBURY.

Location. — From a point in Spring Street, West Roxbury, near the easterly bank of the Charles River, extending north-westerly through private lands near the Charles River to Gardner Street, and in Gardner Street for about 500 feet, a total length of 3,458 linear feet.

Assistant Engineer. — C. Barton Pratt.

Contractor. — The National Contracting Company of New York.

Excavation.

	2 Feet 10 Inches by 2 Feet 11 Inches Sewer.
Length of trench (feet),	3,346.7
Length of tunnel (feet),	111.0
Average depth of trench excavation to bottom of underdrain (feet), . . .	13.5
Greatest depth of trench excavation to bottom of underdrain (feet), . . .	18.5
Average width at top of trench (feet),	7.0
Average width at bottom of trench (feet),	6.3
Average depth from surface of ground to bottom of tunnel excavation (feet),	19.5
Greatest depth from surface of ground to bottom of tunnel excavation (feet),	25.5
Average width of tunnel excavation (feet),	6.5
Volume of trench excavation per linear foot (cubic yards),	3.4
Volume of tunnel excavation per linear foot (cubic yards),	1.5
Approximate cost of trench per linear foot, including sheeting left in, excavation and refilling below masonry, backfilling, etc.,	\$4 84
Approximate cost of tunnel excavation per linear foot, including excavation and refilling below masonry, backfilling, etc.,	5 14

Masonry.

Contract prices : —

Brickwork, American cement mortar, per cubic yard,	\$11 45
Brickwork, Portland cement mortar, per cubic yard,	13 45
Concrete, American cement mortar, per cubic yard,	4 90
Concrete, Portland cement mortar, per cubic yard,	6 50
Cost of masonry, per linear foot trench, including underdrains, tarred paper, etc., to date,	4 27
Cost of section per linear foot of excavation, and masonry, labor, material, inspection and miscellaneous items to date,	9 58

Character of Excavation. — Near the beginning of the section the sewer passed under Spring Street and adjacent property in tunnel for a distance of about 110 feet. This tunnel excavation consisted of gravel with a small amount of rock. From a point near Spring Street to within about 100 feet of Gardner Street the excavation was in marsh lands adjacent to Charles River, consisting of fine wet sand and gravel overlaid with peat. For a length of 260 feet near the middle of the section the peat extended below the sewer, and for this length a pile foundation was built. For the remainder of the section in Gardner street the excavation was in wet sand and gravel.

Work was begun on the section June 10, 1897, and was completed Dec. 16, 1897.

CEMENT TESTING.

Approximately 5,500 barrels of cement have been used during the year, in the proportions of about 1,500 barrels of Portland cement to about 4,000 barrels of American cement.

The cement which has been of the best English and American brands, has been carefully tested for fineness, tensile strength, specific gravity, checking, cracking, etc.

OFFICE AND GENERAL ASSISTANTS.

Assistant Engineers :—

Frank I. Capen, in charge of day work and contract construction on north metropolitan system and maintenance studies.

Frederick D. Smith, in charge of contract construction and maintenance Neponset valley system.

Francis L. Sellew, in charge of surveys and draughting.

Charles E. Hathaway,* in charge of records.

Frank A. Emery, in charge of records and draughtsman.

Assistants on Maintenance Studies :— Theodore Horton, F. W. Crispin.

Draughtsmen :— Richard J. McNulty, Ernest W. Brown.

Stenographers :— Henry P. Fielding,* Thomas Bloomfield.*

Cement Tester :— Nelson A. Hallett.

Messenger :— Madison C. Lewis.

The engineering and office force was temporarily enlarged on account of survey and investigations in connection with the special report for a high-level gravity sewer for the Charles and Neponset areas. Engineers and others engaged on this work will be noted in the report itself.

MAINTENANCE.

The maintenance of the metropolitan sewerage works involves the operation of the four pumping stations, the care of 69 miles of intercepting sewers, siphons and other connected structures, and engineering studies for extensions and care of the works.

The following tables give in detail the extent to which the tributary cities and towns are now using the metropolitan system :—

* For a portion of the year.

CHARLES RIVER VALLEY SYSTEM.

Table showing Cities and Towns delivering Sewage to this System; Approximate Miles of Sewer connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Such Areas; Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Population now contributing to Present Total Populations.

CITIES AND TOWNS.	Miles of Local Sewer connected.	Separate or Combined.	Number of Connections with Local Sewers.	Estimated Number of Persons served by Each House-connection.*	Estimated Population now contributing Sewage.	Estimated Present Total Population.	Estimated Area now contributing Sewage.	Area ultimately to contribute Sewage.	Ratio of Contributing Population to Present Total Population.	Per Cent.	Ratio of Contributing Area to Ultimate Area.
Part of Boston (proper),	15.18	Separate and Combined.	1,875	5.7	10,688	14,200	1.09	1.68	74.7	64.9	
Boston (Brighton),	43.70	Separate and Combined.	2,185	5.7	12,454	17,700	2.88	4.27	70.4	67.4	
Brookline, . . .	51.13	Combined, .	2,038	6.6	13,451	18,600	2.90	4.84	72.4	59.9	
Newton, . . .	80.85	Separate, .	3,310	5.1	16,881	30,700	5.26	13.60	55.0	38.7	
Watertown, . . .	22.42	Separate, .	1,133	4.7	5,525	8,700	1.60	4.04	53.5	39.6	
Waltham, . . .	37.39	Separate, .	2,580	5.6	14,448	22,500	2.37	13.63	64.2	17.4	
Total, . . .	250.67	-	13,121	5.6	73,447	112,400	16.10	42.06	65.3	38.3	

* This is estimated from assessors' statement of the number of houses in each city or town, and the population from census of 1895 extended to 1898.

NORTH METROPOLITAN SYSTEM.

Table showing Cities and Towns delivering Sewage to this System; Approximate Miles of Sewer connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Such Areas; Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Populations now contributing to Present Total Populations.

CITIES AND TOWNS.	Miles of Local Sewer connected.	Separate or Combined.	Number of Connections with Local Sewers.	Estimated Number of Persons served per Each House-connection.*	Estimated Population now contributing Sewage.	Estimated Present Total Population.	Square Miles. now contributing Sewage.	Area ultimately to contribute Sewage.	Ratio of Contributing Population to Present Total	Per Cent.	Ratio of Contributing Area to Ultimate Area.
Boston (Deer Island), .	.30	Separate, .	-	-	1,500†	1,500	-	-	-	-	-
Winthrop, . . .	21.66	Separate, .	1,294	3.6	4,658	5,200	1.08	1.61	89.5	67.0	-
Boston (East Boston), .	13.90	Separate and combined.	4,659	8.8	41,000	46,500	0.68	2.18	88.1	31.2	-
Chelsea, . . .	6.52	Combined, .	1,338	8.0	10,700	33,200	0.26	2.24	32.3	11.6	-
Everett, . . .	10.82	Separate, .	821	5.3	4,351	23,000	0.70	3.34	19.0	21.0	-
Malden, . . .	40.79	Separate, .	2,528	5.3	13,398	34,500	2.42	5.07	38.8	47.7	-
Melrose, . . .	31.30	Separate, .	1,141	4.3	4,906	14,200	1.45	3.73	34.6	38.9	-
Boston (Charlestown), .	14.29	Separate and combined.	4,197	8.1	34,000†	41,700	0.49	1.27	81.6	38.6	-
Cambridge, . . .	104.40	Separate and combined.	12,970	6.5	84,300	88,800	4.82	6.11	95.0	79.0	-
Somerville, . . .	71.10	Separate and combined.	10,545	5.5	58,000	59,400	3.11	3.96	97.8	78.5	-
Medford, . . .	41.20	Separate, .	1,743	5.2	9,053	17,200	2.01	8.35	52.7	24.1	-

Winchester,	15.52	Separate, .	316	5.3	1,675	6,900	0.79	5.95	24.3	13.3
Woburn,	11.14	Separate, .	655§	5.6	3,668	15,200	0.87	12.70	24.2	6.9
Stoneham,	9.80	Separate, .	170	4.6	782	6,700	0.55	5.50	11.7	10.0
Arlington,	14.64	Separate, .	261	5.4	1,409	7,500	1.28	5.20	18.8	24.6
Belmont,	5.49	Separate, .	105	5.7	1,030	3,500	0.74	4.66	29.5	15.9
Wakefield,¶	-	-	-	-	-	700	-	0.95	-	-
Lexington,¶	-	-	-	-	-	2,500	-	5.11	-	-
Total,	412.87	-	42,743	6.4	274,430	408,200	21.25	77.93	67.2	27.3

* This is estimated from assessors' statement of the number of houses in each city or town, and the population from census of 1895 extended to 1898.

† Estimated by Superintendent J. R. Gerrish of the Institution on Deer Island.

‡ Including 30 persons at navy yard.

§ Exclusive of Mystic valley sewer and tanneries. || Including 2 connections with McLean Hospital, having an estimated population of 443.

¶ Wakefield and Lexington not connected.

NEPONSET VALLEY SYSTEM.

Table showing Cities and Towns delivering Sewage to this System; Approximate Miles of Sewer connected; Estimated Populations and Areas now contributing; Total Areas ultimately to contribute, and Present Populations on Such Areas; Ratios of Present Contributing Areas to Ultimate Areas, and Ratios of Populations now contributing to Present Total Populations.

CITIES AND TOWNS.	Miles of Local Sewer connected.	Separate or Combined.	Number of Connections with Local Sewers.	Estimated Number of Persons served by Each House-connection.*	Estimated Population now contributing Sewage.	Estimated Present Total Population.	Square Miles now contributing Sewage.	Area ultimately to contribute Sewage.	Ratio of Contributing Population to Present Total Population.	Per Cent.	Ratio of Contributing Area to Ultimate Area.
Boston (Dorchester), .	10.48	Separate and combined.	759	6.3	4,772	10,400	0.68	2.59	45.9	26.3	
Milton,	2.90	Separate and combined.	25	5.3	133	3,700	0.15	12.59	3.6	1.2	
Hyde Park,	9.95	Separate.	163	7.7	1,250*	13,200	0.62	4.57	9.5	13.6	
Dedham,	-	-	-	-	-	4,800	-	14.10	-	-	
Boston (West Roxbury), .	2.45	Separate.	-	-	200†	1,800	0.17	4.02	11.8	4.2	
Brookline,	-	-	-	-	-	400	-	1.97	-	-	
Newton,	-	-	-	-	-	400	-	4.43	-	-	
Total,	25.78	-	947	6.7	6,355	34,700	1.62	44.27	18.3	3.7	

* Estimated by engineer of town of Hyde Park.

† Parental School.

The four pumping stations of the north metropolitan system have been in continuous operation during the year. The pumping plants and buildings are in excellent condition.

The records of the quantities pumped and other data in relation to the stations are given below : —

DEER ISLAND PUMPING STATION.

At this station are two submerged centrifugal pumps, with impellers or wheels 8.25 feet in diameter, driven by triple-expansion engines of the Reynolds-Corliss type.

Nominal capacity of pumps : 45,000,000 gallons each, with 12-foot lift.

Average duty for the year, 59,000,000 foot-pounds.

Average quantity raised each day, 41,100,000 gallons.

Force employed : 3 engineers, 3 screenmen, 3 firemen and 1 reliefman.

Coal used : first-quality Cumberland, costing from \$2.76 to \$3.35 per ton.

Table of Approximate Quantities, Lifts and Duties at the Deer Island Pumping Station of the North Metropolitan System.

MONTHS.	Total Pumpage (Gallons).	Average per Day (Gallons).	Minimum Day (Gallons).	Maximum Day (Gallons).	Average Lift (Feet).	Average Duty (Million ft.-lbs. per 100 lbs. Coal).
1897-98.						
October, .	943,144,000	30,424,000	24,700,000	38,200,000	10.70	59,200,000
November, .	1,148,310,000	38,277,000	28,400,000	58,700,000	10.76	60,500,000
December, .	1,179,500,000	38,000,000	28,800,000	60,700,000	10.75	56,500,000
January, .	1,150,100,000	37,100,000	31,500,000	46,500,000	10.95	56,200,000
February, .	1,435,700,000	51,300,000	33,300,000	80,900,000	11.01	58,800,000
March, .	1,322,900,000	42,700,000	34,400,000	52,000,000	10.72	58,600,000
April, .	1,356,600,000	45,200,000	31,300,000	73,000,000	11.13	58,900,000
May, .	1,400,600,000	45,200,000	34,800,000	68,800,000	11.34	62,300,000
June, .	1,225,800,000	40,900,000	34,200,000	52,600,000	11.09	60,500,000
July, .	1,215,600,000	39,200,000	30,300,000	63,500,000	10.96	57,100,000
August, .	1,429,600,000	46,100,000	32,300,000	73,000,000	10.12	61,000,000
September, .	1,144,600,000	38,200,000	32,000,000	49,300,000	9.61	56,900,000
Total, .	14,952,454,000	-	-	-	-	-
Average, .	-	41,100,000	31,300,000	59,800,000	10.76	58,900,000

EAST BOSTON PUMPING STATION.

At this station are two submerged centrifugal pumps, with impellers or wheels, 8.25 feet in diameter, driven by triple-expansion engines of the Reynolds-Corliss type.

Nominal capacity of pumps : 45,000,000 gallons each, with 16-foot lift.

Average duty for the year : 53,000,000 foot-pounds.

Average quantity raised each day : 38,700,000 gallons.

Force employed : 3 engineers, 3 screenmen, 3 firemen and 1 reliefman.

Coal used : first-quality Cumberland, costing from \$2.85 to \$3.24 per ton.

Table of Approximate Quantities, Lifts and Duties at the East Boston Pumping Station of the North Metropolitan System.

MONTHS.	Total Pumpage (Gallons).	Average per Day (Gallons).	Minimum Day (Gallons).	Maximum Day (Gallons).	Average Lift (Feet).	Average Duty (Million ft.-lbs. per 100 lbs. Coal).
1897-98.						
October, .	878,054,000	28,324,000	22,600,000	36,100,000	15.66	58,200,000
November, .	1,085,311,000	36,177,000	26,200,000	56,600,000	14.87	54,800,000
December, .	1,098,100,000	35,400,000	26,300,000	61,200,000	14.67	50,700,000
January, .	1,083,500,000	35,000,000	28,100,000	49,100,000	15.06	54,600,000
February, .	1,337,200,000	49,000,000	33,500,000	81,500,000	15.16	62,200,000
March, .	1,254,400,000	40,500,000	29,300,000	49,700,000	15.07	53,300,000
April, .	1,270,300,000	42,300,000	28,700,000	73,600,000	15.20	52,200,000
May, .	1,300,500,000	41,900,000	29,000,000	67,900,000	15.27	48,800,000
June, .	1,188,700,000	39,600,000	34,200,000	54,700,000	15.05	50,100,000
July, .	1,153,300,000	37,200,000	31,100,000	50,500,000	14.97	49,600,000
August, .	1,339,800,000	43,200,000	35,300,000	65,400,000	15.42	50,700,000
September, .	1,078,800,000	36,000,000	32,600,000	40,900,000	15.02	51,700,000
Total, .	14,067,965,000	-	-	-	-	-
Average, .	-	38,700,000	29,700,000	57,300,000	15.12	53,100,000

CHARLESTOWN PUMPING STATION.

At this station are two submerged centrifugal pumps with impellers or wheels 7.5 feet in diameter, driven by triple-expansion Reynolds-Corliss engines.

Nominal capacity of pumps: 22,000,000 gallons each, with 8-foot lift.

Average duty for the year: 60,600,000 foot-pounds.

Average quantity raised each day: 24,800,000 gallons.

Force employed: 3 engineers, 3 screenmen, 3 firemen and 1 reliefman.

Coal used: first-quality Cumberland, costing from \$2.79 to \$2.98 per ton.

Table of Approximate Quantities, Lifts and Duties at the Charlestown Pumping Station of the North Metropolitan System.

MONTHS.	Total Pumpage (Gallons).	Average per Day (Gallons).	Minimum Day (Gallons).	Maximum Day (Gallons).	Average Lift (Feet).	Average Duty (Million ft.-lbs. per 100 lbs. Coal).
1897-98.						
October, .	572,940,000	18,482,000	14,700,000	22,300,000	7.80	56,500,000
November, .	821,354,000	27,379,000	20,600,000	45,000,000	7.88	69,300,000
December, .	734,800,000	23,700,000	19,100,000	38,500,000	7.89	58,700,000
January, .	776,800,000	25,100,000	18,600,000	35,100,000	7.80	65,700,000
February, .	859,100,000	30,700,000	24,800,000	42,600,000	7.63	67,700,000
March, .	790,400,000	25,500,000	20,100,000	31,200,000	8.34	62,400,000
April, .	815,300,000	27,200,000	20,000,000	43,000,000	8.44	65,700,000
May, .	800,800,000	25,800,000	18,900,000	43,000,000	8.17	57,500,000
June, .	729,000,000	24,300,000	19,300,000	33,800,000	7.72	56,200,000
July, .	690,500,000	22,300,000	17,100,000	29,700,000	7.65	53,600,000
August, .	784,700,000	25,300,000	19,500,000	34,400,000	7.76	60,300,000
September, .	650,900,000	21,700,000	16,500,000	27,300,000	7.87	53,300,000
Total, .	9,026,594,000	-	-	-	-	-
Average, .	-	24,800,000	19,100,000	35,500,000	7.91	60,600,000

ALEWIFE BROOK PUMPING STATION.

The plant consists of small commercial pumps and engines, — two 9-inch Andrews vertical centrifugal pumps, with direct-connected compound marine engines.

Capacity of pumps: 4,500,000 gallons each, with 13-foot lift.

Average duty for the year: 16,300,000 foot-pounds.

Average quantity raised each day: 3,176,000 gallons.

Force employed: 2 engineers working 12-hour shifts each.

Coal used: first-quality Cumberland, costing from \$3.45 to \$3.88 per ton.

Table of Approximate Quantities, Lifts and Duties of the Alewife Brook Pumping Station of the North Metropolitan System

MONTHS.	Total Pumpage (Gallons).	Average per Day (Gallons).	Minimum Day (Gallons).	Maximum Day (Gallons).	Average Lift (Feet).	Average Duty (Million ft.-lbs. per 100 lbs. Coal).
1897-98.						
October, .	68,560,000	2,212,000	1,700,000	2,928,000	13.10	15,200,000
November, .	82,868,000	2,762,000	1,616,000	4,085,000	12.65	16,300,000
December, .	104,929,000	3,385,000	2,503,000	6,271,000	12.71	17,800,000
January, .	104,000,000	3,355,000	2,692,000	5,753,000	12.90	18,000,000
February, .	124,333,000	4,440,000	3,078,000	7,462,000	12.78	19,500,000
March, .	122,727,000	3,959,000	2,550,000	5,364,000	13.36	19,600,000
April, .	107,566,000	3,586,000	2,692,000	5,364,000	13.20	18,100,000
May, .	105,151,000	3,392,000	2,273,000	5,044,000	13.12	16,500,000
June, .	86,684,000	2,889,000	2,078,000	3,910,000	13.23	14,800,000
July, .	79,029,000	2,549,000	1,658,000	5,044,000	13.32	12,900,000
August, .	99,541,000	3,211,000	1,952,000	5,688,000	13.28	14,200,000
September, .	71,158,000	2,372,000	1,784,000	3,078,000	13.42	12,300,000
Total, .	1,156,546,000	—	—	—	—	—
Average, .	—	3,176,000	2,215,000	4,999,000	13.09	16,300,000

The average cost of pumping during the year at the pumping stations of the north metropolitan system is given below: —

Average Yearly Cost per Million Foot-gallons for Pumping at the Deer Island Station.

Annual Volume (14,952 Million Gallons) × Lift (10.76 Feet) = 160,888 Million Foot-gallons.

ITEMS.	Cost.	Cost per Million Foot-gallons.
Labor,	\$7,080 11	\$0.04400*
Coal,	3,154 29	.01950
Oil,	311 05	.00190
Waste,	42 39	.00025
Water,	536 40	.00330
Packing,	187 41	.00115
Miscellaneous supplies and renewals,	1,127 25	.00700
Total,	\$12,438 90	\$0.07710

* Includes labor at screens; deducting this item gives cost of labor \$0.0383. Deducting labor at screens gives cost of pumping \$0.0714.

Average Yearly Cost per Million Foot-gallons for Pumping at the East Boston Station.

Annual Volume (14,068 Million Gallons) \times Lift (15.12 Feet) = 212,708 Million Foot-gallons.

ITEMS.	Cost.	Cost per Million Foot-gallons.
Labor,	\$7,322 61	\$0.03440*
Coal,	4,629 13	.02170
Oil,	294 28	.00130
Waste,	56 31	.00020
Water,	811 20	.00380
Packing,	30 14	.00010
Miscellaneous supplies and renewals,	1,127 17	.00530
Total,	\$14,270 84	\$0.06680

* Includes labor at screens; deducting this item gives cost of labor \$0.0290. Deducting labor at screens gives cost of pumping \$0.0614.

Average Yearly Cost per Million Foot-gallons for Pumping at the Charlestown Station.

Annual Volume (9,027 Million Gallons) \times Lift (7.91 Feet) = 71,400 Million Foot-gallons.

ITEMS.	Cost.	Cost per Million Foot-gallons.
Labor,	\$6,666 45	\$0.09330
Coal,	1,447 42	.02030
Oil,	380 41	.00530
Waste,	53 18	.00074
Water,	268 00	.00370
Packing,	79 35	.00110
Miscellaneous supplies and renewals,	731 70	.01020
Total,	\$9,626 51	\$0.13464

Average Yearly Cost per Million Foot-gallons for Pumping at the Alewife Brook Station.

Annual Volume (1,157 Million Gallons) \times Lift (13.09 Feet) = 15,139 Million Foot-gallons.

ITEMS.	Cost.	Cost per Million Foot-gallons.
Labor,	\$2,394 18	\$0.15810
Coal,	1,275 93	.08430
Oil,	174 63	.01150
Waste,	19 07	.00126
Water,	208 92	.01380
Packing,	29 78	.00197
Miscellaneous supplies and renewals,	126 98	.00838
Total,	\$4,229 49	\$0.27931

A comparison of these costs per million foot-gallons with the amounts given in the ninth annual report for last year indicates that a considerable reduction in cost of pumping has been effected

during the year. The rate per million gallons at Deer Island has been reduced 10 per cent. ; at East Boston, 14 per cent. ; at Charlestown, 17 per cent. ; at Alewife Brook, 23 per cent.

VOLUME OF MATERIAL INTERCEPTED AT THE SCREENS.

The sewage is passed through cages or screens before it reaches the pumps at the large stations. These screens are hung in the lower sewer so that they can be raised or lowered by steam power and are set in pairs, one before the other. They are formed of iron rods, at Charlestown with $2\frac{3}{4}$ -inch spaces, and at all other stations with 1-inch spaces. They intercept substances of a size which should not go through the pumps.

The matter found on the screens consists of sand, rags, paper, fragments of fat, fruit and a very small amount of fecal matter. An approximate classification of these substances is given below : —

Composition of Materials found on Screens at Charlestown and East Boston Pumping Stations, June 10, 1898.

CLASSIFICATION OF MATERIAL.	Charlestown Pumping Station (Per- centages by Volume).	East Boston Pumping Station (Per- centages by Volume.
Paper,	55	55
Rags,	25	25
Hair,	5	5
Fecal matter and grease,	5	5
Refuse from slaughter houses,	5	3
Conglomerate matter,	5	7
Total,	100	100

At the large stations at Deer Island and East Boston the screenings are squeezed in a press, and the residue is burned under the boilers. At Charlestown and Alewife Brook the screenings are disposed of with the ashes at the public dumps near the stations.

The total quantity raised on the screens for one year is given in the following table : —

NAME OF STATION.	Total Quantity raised on the Screens Sept. 30, 1897, to Sept. 30, 1898.
	Cubic Yards.
Deer Island,	120
East Boston,	233
Charlestown,	207
Alewife Brook,	46
Total,	606

This is at an average rate of 1.09 cubic feet per million gallons pumped at Deer Island.

CARE OF SEWERS AND SPECIAL STRUCTURES.

The 69 miles of metropolitan sewers are maintained by a permanent force of one foreman, 6 assistant foremen and 18 laborers, with 5 horses and carts. They inspect at regular intervals the regulating valves at the public connections, flush and clean the sewers as needed, remove ashes and screenings from the stations, clean sand catchers and flush siphons as needed, and maintain a ferry at Shirley Gut.

The total expenditure on account of this force for the year has been as follows : —

North metropolitan system,	\$24,975 27
Charles River system,	2,062 13
Neponset valley system,	1,318 85
Total,	<hr/> \$28,356 25

The metropolitan sewers are all in good condition. Considerable labor has been required to maintain the Mystic valley sewer, purchased from the city of Boston, which receives tannery drainage in Winchester and Woburn.

Labor for hand cleaning and flushing on this section of the sewer has cost during the year \$216.

Very little material has been collected during the year in the sand catchers at the upper ends of the siphons, so that practically all the sand and other heavy matters received into the system has been forced along through the pumping stations to the outlet, except such matters as have been intercepted at the screens.

To be assured that the siphons are not gradually silting up, careful records of losses of head at the siphons have been made at regular intervals during the year. The observations indicate that no appreciable deposits have thus far occurred.

The outfall is in good condition, and no noticeable effect is discovered from sewage discharge either on Deer Island bar or on the adjacent shores.

ENGINEERING STUDIES AND SUPPLIES.

There have been made during the year careful studies of the engine records ; surveys and studies for a branch sewer to a district in the north-westerly end of Everett, and a variety of studies relating to all systems, and record maps of completed Neponset

valley sections have been finished. The above, with clerical services, office supplies and maintenance of the office building No. 1 Mt. Vernon Street, have cost for the year, \$10,301.13.

I desire to thank you for continued courtesy and kindness during the year, and to express my appreciation of the efficient service of all the employees in the engineering department.

Respectfully submitted,

WILLIAM M. BROWN, JR.,
Chief Engineer and Superintendent.

APPENDIX.

TABLE A.—Miscellaneous Bids upon North Metropolitan Sewerage System.

NAME OF BIDDER.	ADDRESS.	DEER ISLAND PUMPING STATION.		EAST BOSTON PUMPING STATION.		CHARLESTOWN PUMPING STATION.		EAST BOSTON PUMPING STATION.	
		COAL. ¹		COAL. ¹		COAL. ¹		DREDGING. ²	
		Bids opened Oct. 2, 1898.	Bids opened April 2, 1898.	Bids opened April 2, 1898.	Bids opened April 2, 1898.	Bids opened April 2, 1898.	Bids opened Feb. 19, 1898.		
John Morrison,	East Boston, Mass., .	\$2 97 ³ *	\$3 06 ⁴	\$3 15 ⁴	\$3 09 ⁴	-	-	-	
Sturtevant, Norton & Co., .	Boston, Mass., .	2 85 ⁴	2 92 ⁴	2 92 ⁴	2 98 ⁴	-	-	-	
C. A. Campbell & Co., . .	Boston, Mass., .	3 03 ⁵	3 05 ⁵ *	3 05 ⁵ *	3 05 ⁵ *	-	-	-	
E. B. Townsend,	Boston, Mass., .	3 39 ⁵	-	-	-	-	-	-	
Edward M. Alden,	Boston, Mass., .	-	3 05 ⁴	3 05 ⁴	3 05 ⁴	-	-	-	
L. G. Burnham & Co., . .	Boston, Mass., .	-	2 99 ⁴	3 19 ⁴	3 19 ⁴	-	-	-	
Garfield & Proctor Coal Co., .	Boston, Mass., .	-	3 07 ⁶	3 07 ⁶	3 07 ⁶	-	-	-	
Horatio Wellington & Co., .	Boston, Mass., .	-	-	-	3 17 ⁴	-	-	-	
Eastern Dredging Co., . .	Boston, Mass., .	-	-	-	-	65 c. per cu. yd.*	-	-	
N. E. Dredging Co., . . .	Boston, Mass., .	-	-	-	-	67 c. per cu. yd.	-	-	
Bay State Dredging Co., . .	Boston, Mass., .	-	-	-	-	2 days @ \$2 p. day	-	-	
Waldo Bros.,	Boston, Mass., .	-	-	-	-	-	-	-	

Berry & Ferguson, . . .	Boston, Mass., .	-	-	-	-	-	-
Pierce & Winn Co, . . .	Arlington, Mass., .	-	-	-	-	-	-
D. W. Lewis, . . .	Boston, Mass., .	-	-	-	-	-	-
Geo. D. Goodrich, . . .	Boston, Mass., .	-	-	-	-	-	-
Portland Stoneware Co., . .	Boston, Mass., .	-	-	-	-	-	-
Lexington Lumber Co., . .	Lexington, Mass., .	-	-	-	-	-	-
Curtis & Pope Lumber Co., .	Boston, Mass., .	-	-	-	-	-	-
P. H. & F. M. Roots Co., . .	New York, N. Y., .	-	-	-	-	-	-
Prindle Pump Co., . . .	New York, N. Y., .	-	-	-	-	-	-
G. F. Blake Mfg. Co., . . .	New York, N. Y., .	-	-	-	-	-	-
Burham & Granger, . . .	New York, N. Y., .	-	-	-	-	-	-
Edward P. Allis Co., . . .	Milwaukee, Wis., .	-	-	-	-	-	-
Holly Manufacturing Co., . .	Lockport, N. Y., .	-	-	-	-	-	-

* Contract awarded.

¹ Per long ton (2,240 lbs.).⁴ Boston (George's Creek-Cumberland).² Estimated quantity 500 cu. yds.⁵ New River or G. C.-Cumberland.³ New River.⁶ Ocean Mine.

TABLE A. — *Miscellaneous Bids upon North Metropolitan Sewerage System* — Concluded.

NAME OF BIDDER.	ADDRESS.	LEXINGTON BRANCH.		ADDITIONAL PUMPING PLANT AT			
		UNDERDRAIN PIPE, 4,500 FEET.		DEER ISLAND PUMPING STATION.	EAST BOSTON PUMPING STATION.	CHARLESTOWN PUMPING STATION.	NO. SOMERVILLE PUMPING STATION.
		Bids opened March 19, 1898.		Bids opened Sept. 3, 1898.	Bids opened Sept. 3, 1898.	Bids opened Sept. 3, 1898.	Bids opened Sept. 3, 1898.
John Morrison,	East Boston, Mass., .	Discount.		—	—	—	—
Sturtevant, Norton & Co., . .	Boston, Mass., .	—		—	—	—	—
C. A. Campbell & Co., . . .	Boston, Mass., .	—		—	—	—	—
E. B. Townsend,	Boston, Mass., .	—		—	—	—	—
Edward M. Alden,	Boston, Mass., .	—		—	—	—	—
L. G. Burnham & Co., . . .	Boston, Mass., .	—		—	—	—	—
Garfield & Proctor Coal Co., .	Boston, Mass., .	—		—	—	—	—
Horatio Wellington & Co., . .	Boston, Mass., .	—		—	—	—	—
Eastern Dredging Co., . . .	Boston, Mass., .	—		—	—	—	—
N. E. Dredging Co.,	Boston, Mass., .	—		—	—	—	—
Bay State Dredging Co., . . .	Boston, Mass., .	—		—	—	—	—
Waldo Bros.,	Boston, Mass., .	68 per cent. ¹ .		—	—	—	—

Berry & Ferguson,	Boston, Mass.,	68 per cent., ¹	-	-	-	-	-
Pierce & Winn Co.,	Arlington, Mass.,	68 per cent., ²	-	-	-	-	-
D. W. Lewis,	Boston, Mass.,	68 per cent., ¹	-	-	-	-	-
Geo. D. Goodrich,	Boston, Mass.,	68 per cent., ¹	-	-	-	-	-
Portland Stoneware Co.,	Boston, Mass.,	68 per cent., ³	-	-	-	-	-
Lexington Lumber Co.,	Lexington, Mass.,	68 per cent., ¹	-	-	-	-	-
Curtis & Pope Lumber Co.,	Boston, Mass.,	73 per cent., ^{3*}	-	-	-	-	-
P. H. & F. M. Roots Co.,	New York, N. Y.,	-	-	-	-	\$6,745 00 ⁴	-
Prindle Pump Co.,	New York, N. Y.,	-	-	-	-	5,980 00 ⁵	-
G. F. Blake Mfg. Co.,	New York, N. Y.,	-	\$22,200 00 ⁶	\$22,200 00 ⁶	\$22,200 00 ⁷	7,500 00 ^{5*}	-
Burham & Granger,	New York, N. Y.,	-	-	-	-	7,800 00 ⁵	-
Edward P. Allis Co.,	Milwaukee, Wis.,	-	27,200 00 ^{8*}	25,600 00 ^{8*}	25,800 00 ^{6*}	-	-
Holly Mfg. Co.,	Lockport, N. Y.,	-	20,785 00 ⁶	20,785 00 ⁶	20,785 00 ⁷	-	-

* Contract awarded. ¹ Akron pipe. ² Portland or Akron pipe. ³ Portland pipe. ⁴ 68 million gallons duty.
⁵ 50 million gallons duty. ⁶ 75 million gallons duty. ⁷ 70 million gallons duty. ⁸ 80 million gallons duty.

TABLE B. — *Sections upon North Metropolitan Sewerage System.*

SECTION.	Location.	Advertised for Bids.	Bids opened.	Number of Bids.	Highest.	Lowest.	Contract awarded to.	Amount of Bid.	Work begun.	To be completed.	Length of Section.
Section 53,	Arlington and Lexington.	Feb. 26, 1898,	March 26, 1898,	11	\$34,555 00	\$18,602 50	Long & Little,	\$18,945 00	April 21, 1898,	Oct. 1, 1898,	4,500 feet.
Section 55,	Malden and Everett.	April 2, 1898,	April 30, 1898,	7	5,289 50	3,675 00	A. W. Bryne Con- struction Co.	3,675 00	May 18, 1898,	Aug. 15, 1898,	1,550 feet.

MAINTAINING AND OPERATING THE NORTH METROPOLITAN SYSTEM.

1897.			
Oct.	31,	By supplies for month, general, .	\$3,213 09
	31,	By pay rolls for month, general, .	3,448 88
	31,	By pay rolls for month, Deer Island,	1,001 20
	31,	By pay rolls for month, East Boston,	807 78
	31,	By pay rolls for month, Charlestown,	768 27
	31,	By pay rolls for month, Alewife Brook,	269 04
	31,	By proportionate expenses commissioners, chief engineer, clerk and others, for month, . . .	750 00
			<hr/>
			\$10,258 26
Nov.	30,	By supplies for month, general, .	\$1,294 16
	30,	By pay rolls for month, general, .	2,724 00
	30,	By pay rolls for month, Deer Island,	536 87
	30,	By pay rolls for month, East Boston,	537 70
	30,	By pay rolls for month, Charlestown,	508 89
	30,	By pay rolls for month, Alewife Brook,	183 36
	30,	By proportionate expenses commissioners, chief engineer, clerk and others, for month, . . .	50 00
			<hr/>
			5,834 98
Dec.	31,	By supplies for month, general, .	\$2,956 30
	31,	By pay rolls for month, general, .	2,491 29
	31,	By pay rolls for month, Deer Island,	536 87
	31,	By pay rolls for month, East Boston,	548 41
	31,	By pay rolls for month, Charlestown,	504 48
	31,	By pay rolls for month, Alewife Brook,	189 36
	31,	By proportionate expenses, commissioners, chief engineer, clerk and others, for month, . . .	633 34
			<hr/>
			7,860 05
1898.			
Jan.	31,	By supplies for month, general, .	\$3,436 57
	31,	By pay rolls for month, general, .	3,008 34
	31,	By pay rolls for month, Deer Island,	813 78
	31,	By pay rolls for month, East Boston,	816 78
	31,	By pay rolls for month, Charlestown,	778 63
	31,	By pay rolls for month, Alewife Brook,	269 04
	31,	By proportionate expenses, commissioners, chief engineer, clerk and others, for month, . . .	875 00
			<hr/>
			9,998 14
Feb.	28,	By supplies for month, general, .	\$2,740 18
	28,	By pay rolls for month, general, .	2,547 00
	28,	By pay rolls for month, Deer Island,	538 52
	28,	By pay rolls for month, East Boston,	538 52
	28,	By pay rolls for month, Charlestown,	497 35
			<hr/>
			<i>Amounts carried forward, .</i>
			<hr/>
			\$6,861 57
			<hr/>
			\$33,951 43

MAINTAINING AND OPERATING THE NORTH METROPOLITAN SYSTEM
— *Continued.*

		<i>Amounts brought forward,</i>	\$6,861 57	\$33,951 43
1898.				
Feb.	28,	By pay rolls for month, Alewife Brook,	204 36	
	28,	By proportionate expenses, commissioners, chief engineer, clerk and others, for month, . . .	858 33	
				7,924 26
March	31,	By supplies for month, general, . .	\$838 05	
	31,	By pay rolls for month, general, . .	1,890 39	
	31,	By pay rolls for month, Deer Island, . .	547 76	
	31,	By pay rolls for month, East Boston, . .	535 89	
	31,	By pay rolls for month, Charlestown, . .	515 48	
	31,	By pay rolls for month, Alewife Brook,	189 36	
	31,	By proportionate expenses, commissioners, chief engineer, clerk and others, for month, . . .	958 34	
				\$5,475 27
April	30,	By supplies for month, general, . .	\$2,496 46	
	30,	By pay rolls for month, general, . .	2,087 25	
	30,	By pay rolls for month, Deer Island, . .	273 88	
	30,	By pay rolls for month, East Boston, . .	536 54	
	30,	By pay rolls for month, Charlestown, . .	515 48	
	30,	By pay rolls for month, Alewife Brook,	183 36	
	30,	By proportionate expenses, commissioners, chief engineer, clerk and others, for month, . . .	750 00	
				6,842 97
May	31,	By supplies for month, general, . .	\$3,277 74	
	31,	By pay rolls for month, general, . .	788 00	
	31,	By pay rolls for month, Deer Island, . .	551 06	
	31,	By pay rolls for month, East Boston, . .	280 80	
	31,	By pay rolls for month, Charlestown, . .	261 03	
	31,	By pay rolls for month, Alewife Brook,	85 68	
	31,	By proportionate expenses, commissioners, chief engineer, clerk and others, for month, . . .	875 00	
				6,119 31
June	30,	By supplies for month, general, . .	\$4,497 44	
	30,	By pay rolls for month, general, . .	2,652 57	
	30,	By pay rolls for month, Deer Island, . .	805 68	
	30,	By pay rolls for month, East Boston, . .	272 16	
	30,	By pay rolls for month, Charlestown, . .	765 80	
		<i>Amounts carried forward,</i>	\$8,993 65	\$60,313 24

MAINTAINING AND OPERATING THE NORTH METROPOLITAN SYSTEM
— *Concluded.*

		<i>Amounts brought forward,</i>	\$8,993 65	\$60,313 24
1898.				
June	30,	By pay rolls for month, Alewife Brook,	183 36	
	30,	By proportionate expenses, commissioners, chief engineer, clerk and others, for month,	750 00	9,927 01
July	31,	By supplies for month, general, . .	\$1,607 86	
	31,	By pay rolls for month, general, . .	2,914 52	
	31,	By pay rolls for month, Deer Island, . .	797 55	
	31,	By pay rolls for month, East Boston, . .	1,481 99	
	31,	By pay rolls for month, Charlestown, . .	515 48	
	31,	By pay rolls for month, Alewife Brook,	187 86	
	31,	By proportionate expenses, commissioners, chief engineer, clerk and others, for month,	750 00	8,255 26
Aug.	31,	By supplies for month, general, . .	\$827 12	
	31,	By pay rolls for month, general, . .	1,582 75	
	31,	By pay rolls for month, Deer Island, . .	547 76	
	31,	By pay rolls for month, East Boston, . .	580 10	
	31,	By pay rolls for month, Charlestown, . .	773 22	
	31,	By pay rolls for month, Alewife Brook,	278 04	
	31,	By proportionate expenses, commissioners, chief engineer, clerk and others, for month,	858 33	5,447 32
Sept.	30,	By supplies for month, general, . .	\$903 09	
	30,	By pay rolls for month, general, . .	1,582 96	
	30,	By pay rolls for month, Deer Island, . .	276 10	
	30,	By pay rolls for month, East Boston, . .	625 43	
	30,	By pay rolls for month, Charlestown, . .	257 74	
	30,	By pay rolls for month, Alewife Brook,	189 36	
	30,	By proportionate expenses, commissioners, chief engineer, clerk and others, for month,	950 00	4,784 68
				\$88,727 51

MAINTAINING AND OPERATING THE CHARLES RIVER VALLEY
SYSTEM.

1897.				
Oct.	31,	By amount paid for labor for month,	\$270 00	
	31,	By amount paid for salaries, commissioners, etc., for month, .	125 00	\$395 00
Dec.	31,	By amount paid city of Boston for disposing of sewage to Jan. 1, 1898,	\$6,750 00	
	31,	By amount paid for labor for month,	340 00	7,090 00
1898.				
Jan.	31,	By amount paid for labor for month,	\$135 00	
	31,	By amount paid for salaries, commissioners, etc., for month, .	358 33	
	31,	By amount paid for supplies for month,	113 58	
	31,	By amount paid city of Boston for balance due for disposing of sewage for 1896-97,	56,014 00	56,620 91
Feb.	28,	By amount paid for labor for month,	\$135 00	
	28,	By amount paid for supplies for month,	5 20	
	28,	By amount paid for salaries, commissioners, etc., for month, .	333 33	473 53
March	31,	By amount paid for labor for month,	\$202 50	
	31,	By amount paid for salaries, commissioners, etc., for month, .	358 34	560 84
April	30,	By amount paid for salaries, commissioners, etc., for month, .	\$358 33	358 33
May	31,	By amount paid for salaries, commissioners, etc., for month, .	\$358 33	358 33
June	30,	By amount paid for salaries, commissioners, etc., for month, .	\$358 34	358 34
July	31,	By amount paid for labor for month,	\$774 00	
	31,	By amount paid for salaries, commissioners, etc., for month, .	358 33	
	31,	By amount paid for supplies for month,	45 00	1,177 33
Aug.	31,	By amount paid for salaries, commissioners, etc., for month, .	\$200 00	200 00
Sept.	30,	By amount paid for labor for month,	\$270 00	
	30,	By amount paid for salaries, commissioners, etc., for month, .	358 34	628 34
				\$68,220 95

MAINTAINING AND OPERATING THE NEPONSET VALLEY SYSTEM.

1897.			
Oct. 31,	By amount paid for labor for month,	\$284 19	\$284 19
Nov. 30,	By amount paid for salaries, for month,	\$516 66	
Dec. 31,	By amount paid for salaries, for month,	\$250 00	516 66
1898.			250 00
Jan. 31,	By amount paid for salaries, for month,	\$208 33	208 33
Feb. 28,	By amount paid for salaries, for month,	\$250 00	1,270 87
28,	By amount paid for supplies for month,	356 24	
28,	By amount paid for labor for month,	664 63	
March 31,	By amount paid for salaries for month,	\$125 00	
31,	By amount paid for labor for month,	670 81	795 81
April 30,	By amount paid for salaries for month,	\$333 33	333 33
May 31,	By amount paid for salaries for month,	\$208 33	208 33
June 30,	By amount paid for salaries for month,	\$200 00	200 00
July 31,	By amount paid for supplies for month,	\$78 12	759 54
31,	By amount paid for labor for month,	481 42	
31,	By amount paid for salaries for month,	200 00	
Aug. 31,	By amount paid for salaries for month,	\$250 00	250 00
Sept. 30,	By amount paid for labor for month,	\$166 50	166 50
			\$5,243 56

DISBURSEMENTS BY YEARS TO SEPT. 30, 1898.

	Year ending Sept. 30, 1889.	Year ending Sept. 30, 1890.	Year ending Sept. 30, 1891.	Year ending Sept. 30, 1892.	Year ending Sept. 30, 1893.	Year ending Sept. 30, 1894.	Year ending Sept. 30, 1895.	Year ending Sept. 30, 1896.	Year ending Sept. 30, 1897.	Year ending Sept. 30, 1898.	Totals.
Office expenses,	\$1,161 29	\$28,792 85	\$30,437 29	\$31,220 76	\$35,191 97	\$33,669 39	\$19,652 19	-	-	-	-*
North Metropolitan system, .	-	116,492 55	582,966 06	962,798 49	1,172,269 02	1,115,190 19	606,488 61	\$400,349 58	\$42,023 27	\$9,785 61	\$5,008,363 38
Charles River valley system, .	-	18,329 41	381,149 33	280,308 29	28,882 27	25,369 13	1,927 35	52,831 53	325 21	11 75	789,134 27
Both systems,	-	2,696 20	5,597 86	7,703 15	12,783 61	15,864 20	302 20	-	-	-	-*
Neponset valley system, . .	-	-	-	-	-	-	2,649 95	200,604 35	405,486 31	212,861 71	821,602 32
Wakefield branch,	-	-	-	-	-	-	-	125 98	27,199 11	8,281 36	35,606 45
Stoneham branch,	-	-	-	-	-	-	-	-	2,802 68	8,764 70	11,567 38
Everett branch,	-	-	-	-	-	-	-	-	-	4,574 73	4,574 73
Lexington branch,	-	-	-	-	-	-	-	-	-	56,583 69	56,583 69
	\$1,161 29	\$166,311 01	\$1,000,150 54	\$1,282,030 69	\$1,249,126 87	\$1,190,092 91	\$631,020 30	\$653,911 44	\$477,836 58	\$300,863 55	\$6,727,432 22
Total expended to Sept. 30, 1898,											\$6,727,432 22

* The accounts "Office expenses" and "Both systems" are charged off to the north metropolitan system and the Charles River valley system, — 85 per cent. to the former and 15 per cent. to the latter (north metropolitan system, \$191,312.02; Charles River valley system, \$33,760.94). This is the proportion made by the apportionment commission in 1891, and has been found by experience to be substantially correct.

EXPENSES OF BOARD OF METROPOLITAN SEWERAGE COMMISSIONERS FOR THE YEAR ENDING SEPT. 30, 1898.

North Metropolitan System.

	1897.			1898.									Totals.
	Oct.	Nov.	Dec.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	
Legal services,	-	\$507 00	-	\$220 45	-	-	-	-	-	-	-	-	\$727 45
Land takings, purchase and recording.	-	758 07	\$1,399 33	115 28	-	-	\$1 30	-	-	\$80 00	-	-	2,353 98
Experts and appraisers,	-	-	-	275 00	-	-	466 00	-	-	-	-	-	741 00
Travelling expenses,	-	-	-	20	-	-	3 00	-	-	-	-	-	3 20
Pumps and alterations, East Boston station.	-	-	-	-	-	-	-	-	\$70 00	36 12	\$14 28	-	120 40
Pumps and alterations, Deer Island station.	-	-	-	-	-	-	-	-	-	28 57	14 28	-	42 85
Pumps and alterations, Charles-town station	-	-	-	-	-	-	-	-	-	2,282 97	741 23	\$1,998 34	5,022 54
Pumps and alterations, Alewife Brook station.	-	-	-	-	-	-	-	-	-	8 10	55 95	173 45	237 50
Deer Island pumping station, . .	-	-	-	-	-	-	-	-	-	44 20	-	-	44 20
East Boston pumping station, . .	-	-	-	-	-	-	-	-	-	5 07	-	-	5 07
Pumps and alterations, office, . .	-	-	-	-	-	-	-	-	-	325 55	33 96	127 91	487 42
Totals,	-	\$1,265 07	\$1,399 33	\$610 93	-	-	\$470 30	-	\$70 00	\$2,810 58	\$859 70	\$2,299 70	\$9,785 61

EXPENSES OF BOARD OF METROPOLITAN SEWERAGE COMMISSIONERS FOR THE YEAR ENDING SEPT. 30, 1898 — Continued.

Neponset Valley System.

	1897.				1898.									Totals.
	Oct.	Nov.	Dec.		Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	
Salaries—engineers, inspectors, rodmen, laborers and others.	\$4,521 05	-	-	-	\$1,984 30	\$1,020 25	-	\$60 34	\$212 41	-	-	-	-	\$7,798 35
Section No. 12,	5 98	-	-	-	-	-	-	1 10	1 64	-	-	-	-	8 72
Section No. 14,	-	-	\$100 77	-	-	-	-	-	-	-	-	-	-	100 77
Section No. 16,	-	\$4,567 51	-	-	-	-	-	-	16 26	-	-	-	-	4,583 77
Section No. 17,	-	1,546 75	54 00	-	-	-	-	-	-	-	-	-	-	1,600 75
Section No. 18,	18 00	-	-	-	-	-	-	-	-	-	-	-	-	18 00
Section No. 19,	5 25	-	-	-	-	14 00	-	-	-	-	-	-	-	19 25
Section No. 20,	-	-	-	-	-	-	-	9 75	122 00	-	-	-	-	131 75
Section No. 21,	-	-	1,588 67	-	-	-	-	-	-	-	-	-	-	1,588 67
Section No. 22,	12 75	-	-	-	1,787 18	-	-	-	-	-	-	-	-	1,799 93
Section No. 23,	35	-	-	-	-	12 03	-	2,056 60	5 50	-	-	-	-	2,074 48
Section No. 24,	567 35	-	-	-	-	-	-	2,851 96	-	-	-	-	-	3,419 31
Section No. 25,	-	1,769 52	-	-	8 52	-	-	-	1 35	-	-	-	-	1,779 39
Section No. 26,	7,978 70	10,505 73	8,289 57	-	3,412 26	2,101 76	-	39 51	-	-	\$6,046 70	-	-	39,274 23
Section No. 27,	8,173 61	8,180 71	2,595 69	-	4,295 78	-	-	-	9 28	\$1,570 40	-	-	-	24,825 47
Section No. 28,	3,704 13	2,799 59	-	-	8 07	-	-	1 30	1,407 30	-	-	-	-	7,920 39
Section No. 29,	4,190 49	1,694 09	-	-	16 38	-	-	974 81	30 00	-	-	-	-	6,905 77

Travelling expenses, . . .	69 80	-	81 00	5 17	34 34	-	28 95	10 55	-	-	-	229 81
Field supplies, . . .	323 79	-	30 53	41 32	2 18	-	71 50	27 81	-	-	-	497 13
Teaming and express, . . .	38 75	-	6 00	-	-	-	3 75	1 45	-	-	-	49 95
Carriage hire, . . .	33 00	-	15 00	15 00	-	-	-	5 50	-	-	-	68 50
Experts and appraisers, . . .	120 00	-	-	-	-	-	-	3 00	-	-	-	123 00
Clerk and chief engineer, . .	516 66	-	308 34	-	-	-	-	-	-	-	-	825 00
Clerical services, . . .	50 00	125 00	-	-	-	-	-	-	-	-	-	175 00
Legal services, . . .	107 00	-	-	-	157 80	-	161 00	56 00	-	84 00	-	565 80
Office supplies, . . .	12 40	-	-	4 00	5 80	-	4 56	6 35	-	-	-	33 11
Maps, plans and blue-prints, .	3 00	-	9 10	-	-	-	38 76	9 15	-	-	-	60 01
Land takings, purchase and recording.	167 35	-	-	1,101 15	753 15	-	1,350 80	1,701 08	-	180 25	-	5,253 78
Postage, telephone and telegrams.	4 15	-	-	2 51	-	-	65 87	45 20	-	-	-	117 73
Tools and repair of same, . .	2 45	-	-	-	10	-	1 00	-	-	-	-	3 55
Photography, . . .	7 12	-	-	2 87	-	-	-	-	-	-	-	9 99
Commissioners, . . .	-	750 00	250 00	-	-	-	-	-	-	-	-	1,000 00
City of Boston sewer, between Central Avenue and Granite bridge.	-	-	-	100,000 00	-	-	-	-	-	-	-	100,000 00
Engineers' instruments and repair of same.	-	-	-	-	35	-	-	-	-	-	-	35
Totals, . . .	\$30,633 13	\$31,938 90	\$13,328 67	\$112,684 51	\$4,101 76	-	\$7,721 56	\$3,671 83	\$1,570 40	\$7,210 95	-	\$212,861 71

Charles River Valley System.

Land takings, purchase and recording.	-	-	-	-	-	-	-	-	-	\$0 75	\$0 75
Legal services,	-	-	-	-	-	-	-	-	-	11 00	11 00
Totals,	-	-	-	-	-	-	-	-	-	\$11 75	\$11 75

Lexington Branch.

Maps, plans and blue-prints, . .	-	-	-	-	-	-	-	-	\$4 20	\$8 96	\$13 16
Legal services,	-	-	-	-	-	-	-	-	-	30 00	30 00
Office supplies,	-	-	-	-	-	-	-	-	7 52	65 62	73 14
Office supplies, purchased from Arlington.	-	-	-	-	-	-	-	-	-	4 55	4 55
Engineers, inspectors, rodmen, laborers and others.	-	-	-	-	-	-	-	-	-	660 43	2,077 93
Land takings, purchase and recording.	-	-	-	-	-	-	-	-	-	2 25	2 25
Travelling expenses,	-	-	-	-	-	-	-	-	29 40	60	41 41
Advertising,	-	-	-	-	-	-	-	-	-	93 90	93 90
Contract work,	-	-	-	-	-	-	-	-	1,496 43	\$4,359 17	5,569 26
Field supplies,	-	-	-	-	-	-	-	-	59 39	38 19	132 78
Engineers' instruments and repair of same.	-	-	-	-	-	-	-	-	-	7 50	7 50
Tools and repair of same,	-	-	-	-	-	-	-	-	-	-	60
Teaming and express,	-	-	-	-	-	-	-	-	-	-	15
Town of Arlington sewers, . .	-	-	-	-	-	-	-	-	-	-	40,000 00
Totals,	-	-	-	-	-	-	-	-	\$1,596 94	\$4,404 86	\$45,972 40
									\$866 31	\$3,694 54	\$56,583 69

NORTH METROPOLITAN SYSTEM.

Construction Account. — Bills outstanding Sept. 30, 1898.

NAME.	Articles.	Amount.
City of Malden,	Sewers,	\$50,096 51
Pay roll,	Engineer's salary,	267 50
Pay roll,	Cement tester,	15 00
Pay roll,	Labor,	387 83
Pay roll,	Labor,	379 67
T. H. Buck & Co.,	Lumber,	34 81
Coffin Valve Company,	Sewer pipe,	17 54
Farley, Harvey & Co.,	Bunting,	9 07
L. M. Ham & Co.,	Iron work,	97 00
Perrin, Seamans & Co.,	Pails,	3 00
J. C. Storey & Co.,	Tarred paper,	2 15
A. J. Wilkinson & Co.,	Hardware,	5 59
Journal Newspaper Company,	Advertising,	25 50
Curtis & Pope Lumber Company,	Pipe,	33 00
W. A. Murtfeldt Company,	Asphalt, etc.,	30 00
P. O'Riorden,	Sand,	9 00
Parry Bros. & Co.,	Brick,	478 50
Waldo Bros.,	Cement,	130 00
Wright & Potter Printing Company,	Printing,	8 05
Wm. H. Gallison Company,	Graphite,	1 00
Total,	\$52,030 72

Maintenance Account. — Bills outstanding Sept. 30, 1898.

Pittsburgh Plate Glass Company,	Glass,	\$2 28
S. A. Dinsmore & Co.,	Germol,	1 50
W. P. Phillips & Co.,	Springs,	1 44
Corson Express Company,	Expressing,	1 00
A. J. Wilkinson & Co.,	Hardware,	1 75
F. W. Barry, Beale & Co.,	Stationery,	1 24
Hawkridge Bros.,	Steel,	69
Wadsworth, Howland & Co.,	Cross-section paper,	4 17
Kate M. Hill,	Seed-plates (for photography),	1 78
Standard Thermometer and Electric Com- pany,	Repairing thermometer,	1 25
Perrin, Seamans & Co.,	Pails,	94
Bacon & Co.,	Iron,	2 57

North Metropolitan System (Maintenance Account) — Continued.

NAME.	Articles.	Amount.
Edw. P. Flak,	Incidentals,	\$72 00
A. J. Wilkinson & Co.,	Hardware,	23
Massachusetts Towel Furnishing Com- pany.	Towel supply,	1 70
James Gurney & Co.,	Castings,	40
Carter, Rice & Co.,	Wrapping paper,	1 25
Hammond, T. W. Co.,	Repairs,	1 55
B. O. & G. C. Wilson,	Supplies,	4 95
Massachusetts Towel Furnishing Com- pany.	Towel supply,	1 50
Morgan Spring Company,	Springs,	4 30
Ames Plow Company,	Tools,	1 29
Madison C. Lewis,	Incidentals,	2 36
Hawkridge Bros.,	Steel,	1 74
Dover Stamping Company,	Supplies,	30
Hammond, T. W. Co.,	Paper,	3 59
Hawkridge Bros.,	Steel,	4 60
John Robbins Manufacturing Company, .	Supplies,	1 02
Chas. C. Hutchinson,	Tide tables,	3 00
Theo. Horton,	Incidentals,	4 16
Wilson & Silsby,	Canvas,	1 05
Blodgett Bros.,	Labor on electric fixtures, . . .	2 02
Ames Plow Company,	Tools,	1 87
W. W. White & Co.,	Mounting plans,	4 20
Deane Steam Pump Company,	Crank,	1 30
Pay rolls,	Labor,	1,859 01
Hopkinson & Holden,	Mats,	4 00
H. H. Harvey,	Steel,	31 99
T. H. Buck & Co.,	Lumber,	33 14
Greenough, Adams & Cushing,	Ink,	2 40
Burditt & Williams,	Hardware,	34 39
Wadsworth, Howland & Co.,	Paints, etc.,	72 60
Bacon & Co.,	Iron,	12 30
Boston Bolt Company,	Bolts,	16 57
Carter, Rice & Co.,	Paper,	9 00
J. Robbins & Co.,	Coal, etc.,	24 45
G. H. Worcester & Co.,	Brooms,	4 40
Crosby Steam Gage and Valve Company,	Valves, labor, etc.,	20 26
A. W. Chesterton & Co.,	Packing,	30 15
City of Boston (institutions department),	Ice,	5 75

North Metropolitan System (Maintenance Account) — Continued.

NAME.	Articles.	Amount.
Dodge, Haley & Co.,	Steel,	\$5 45
City of Boston (sealer of weights and measures).	Testing and sealing scales,	4 07
Chas. E. Moss,	Blue print paper, etc.,	19 69
Boston Ice Company,	Ice,	20 00
Boston Gas Light Company,	Gas supply,	8 70
Seth W. Fuller,	Electric supplies,	9 16
American Steam Gauge Company,	Thermometer,	10 30
Coffin Valve Company,	Castings,	15 20
Edison Electric Illuminating Company,	Electric service,	16 52
Frost & Adams Co.,	Supplies,	3 75
Boston, Revere Beach & Lynn Railroad,	Tickets,	17 50
Derby Desk Company,	Repairing chair,	4 00
Standard Oil Company,	Oil,	39 51
Alden Speare's Sons & Co.,	Candles,	7 50
F. E. Fitts Manufacturing and Supply Company.	Machine cop waste,	10 31
Nash, Winslow & Co.,	Paint, etc.,	16 88
Wyckoff, Seamans & Benedict,	Typewriter supplies,	3 45
Whittier Machine Company,	Labor on elevator,	2 53
American Mason Safety Tread Company,	Safety treads,	9 38
M. R. Warren Company,	Stationery,	4 15
Walworth Manufacturing Company,	Pipe and fittings,	89 05
Henry R. Worthington,	Repairing meter,	11 73
John L. Whiting & Son Company,	Brushes,	14 75
Jas. Wilkinson & Co.,	Electric work,	14 00
Wm. H. Gallison Company,	Supplies,	8 70
Knowlton Packing Company,	Packing,	7 12
The Phillips Company,	Repairing lubricators,	3 00
Mechanics Iron Foundry Company,	Iron work,	10 10
Metropolitan Coal Company,	Coal,	468 80
Bradford Lewis & Son,	Waste,	3 84
City of Somerville,	Water supply,	57 36
Vacuum Oil Company,	Oil,	25 74
Tobias & Wall,	Tool bag,	4 50
J. C. Storey & Co.,	Tarred paper,	3 40
Alex. Haggerston,	Carriage service,	6 80
Alex. Haggerston,	Carriage service,	11 20
Theo. Horton,	Incidentals,	5 88
Smith & Anthony Company,	Pan,	60

North Metropolitan System (Maintenance Account) — Continued.

NAME.	Articles.	Amount.
F. W. Barry, Beale & Co.,	Stationery,	\$1 24
W. J. McGraw & Co.,	Stamp,	3 50
Theo. Horton,	Incidentals,	3 69
Thorp & Martin Company,	Stationery,	3 08
Waldo Bros.,	Sewer pipe,	2 57
Westinghouse, Church, Kerr & Co., .	Oil,	10 17
Wright & Potter Printing Company, .	Printing,	8 29
R. Mitchell & Co.,	Springs,	20 69
J. H. Long Machine Company,	Labor on castings,	16 73
Boston Belting Company,	Hose, couplings, etc.,	13 98
Bacon & Co.,	Iron,	2 79
Albert Winslow & Co.,	Rope,	94
Damrell & Upham,	Book,	1 75
Geo. H. Duncklee,	Carriage hire,	2 00
Chas. A. Schieren & Co.,	Labor on belting,	1 78
Carter, Rice & Co.,	Paper,	1 25
Fairbanks Company,	Repairing iron cock,	2 95
J. C. Storey & Co.,	Tarred paper,	80
Boston Bolt Company,	Split pins,	30
Ames Plow Company,	Salt,	1 20
Crosby Steam Gage and Valve Company,	Gauge glasses, etc.,	4 45
J. A. Glaes & Co.,	Matting,	80
H. A. Winship,	Repairing bag,	75
P. D. Blackden,	Incidentals,	2 71
W. J. McGraw & Co.,	Rubber stamp,	2 50
Rann's Art Store,	X-ray polish,	1 25
Shreve, Crump & Low Company, . . .	Repairing watch,	3 50
G. H. Worcester & Co.,	Brushes,	3 25
Chas. E. Moss,	Blue printing,	2 87
Mass. Towel Furnishing Company, . .	Towel supply,	1 50
F. I. Capen,	Incidentals,	4 48
Alex. Haggerston,	Carriage service,	1 40
Chas. A. Schieren & Co.,	Labor on belting,	75
Boston Bolt Company,	Screws and nuts,	96
M. C. Lewis,	Incidentals,	3 74
Dame, Stoddard & Kendall,	Cord,	63
S. E. Benson & Co.,	Coal and wood,	4 38
Roberts Iron Works Company,	Testing boiler, etc.,	3 85

North Metropolitan System (Maintenance Account) — Concluded.

NAME.	Articles.	Amount.
Pettingell, Andrews Company, . . .	Shades,	\$1 20
Perrin, Seamans & Co.,	Pails,	2 25
Thorp & Martin Company,	Stationery,	3 67
L. W. Ferdinand & Co.,	Oars,	2 86
C. H. McKenney & Co.,	Wicks, lamps, etc.,	3 55
H. H. Harvey,	Crowbars,	2 55
M. R. Warren Company,	Stationery,	1 75
Smith & Anthony Company,	Pipe, etc.,	1 86
Dan'l McGarrigle,	Carriage service,	40 00
Jos. A. Williams,	Repairing clock,	1 00
L. W. Ferdinand & Co.,	Oars,	2 34
Dan'l McGarrigle,	Carriage service,	40 00
J. A. & W. Bird & Co.,	Soda ash,	88
Geo. H. Sampson & Co.,	Buffer,	1 00
Ames Plow Company,	Hoes,	40
Thorp & Martin Company,	Stationery,	4 31
Stoughton Rubber Company,	Repairing rubber boots,	75
Perrin, Seamans & Co.,	Pails,	1 02
U. Holzer,	Mounting maps,	80
Kate M. Hill,	Blue prints,	1 63
Hammond Typewriter Company,	Repairing typewriter,	1 15
Fitz, Dana & Co.,	Iron,	2 06
Farley, Harvey & Co.,	Bunting,	1 46
Fairbanks Company,	Valve discs,	1 94
Codman & Shurtleff,	Bunnell's cells,	60
Berry & Ferguson,	Pipe, etc.,	1 05
Wm. Curley,	Castings,	1 85
Mass. Towel Furnishing Company,	Towel supply,	1 50
Washburn & Moen Manufacturing Com- pany.	Wire,	94
Braman, Dow & Co.,	Couplings,	1 36
Charles River Iron Works,	Examining boilers,	1 40
Wellington-Wild Coal Company,	Coal,	50 75
N. E. Railway Publishing Company,	Pathfinder,	3 00
Paine Furniture Company,	Chairs,	1 50
New England Telephone and Telegraph Company.	Telephone service,	3 50
Total,	\$3,607 37

CHARLES RIVER SYSTEM.

Maintenance Account.—Bills outstanding Sept. 30, 1898.

NAME.	Articles.	Amount.
L. W. Ferdinand & Co.,	Capstan bars,	\$5 00
Total,	\$5 00

NEPONSET VALLEY SYSTEM.

Maintenance Account.—Bills outstanding Sept. 30, 1898.

NAME.	Articles.	Amount.
Chas. A. Green,	Hardware,	\$5 17
W. W. White & Co.,	Mounting maps,	4 55
J. A. Hersey,	Blacksmithing,	6 00
S. B. Balkam & Co.,	Lumber, coal, etc.,	6 65
New York, New Haven & Hartford Rail- road Company.	Tickets,	10 00
F. D. Smith,	Incidentals,	9 18
Chas. E. Moss,	Blue printing,	30 23
S. B. Balkam & Co.,	Lumber, cement, etc.,	4 93
Stoughton Rubber Company,	Rubber boots,	7 13
F. D. Smith,	Incidentals,	13 69
Geo. W. Toomey,	Carriage hire,	2 50
Stoughton Rubber Company,	Rubber boots,	6 42
Chas. A. Green,	Hardware,	4 94
Wright & Potter Printing Company,	Printing,	4 72
L. W. Ferdinand & Co.,	Oiled clothing,	3 50
Chas. A. Green,	Hardware,	2 19
Total,	\$121 80

Claims of Contractors, Sept. 30, 1898.

Mathers & Sullivan, contractors,	Sections 21 and 22.
H. P. Nawn, contractor,	Sections 13-16.
National Contracting Company, contractors,	Sections 26-27.

CLAIMS AGAINST THE COMMISSION, SEPT. 30, 1898. — NEPONSET
VALLEY SYSTEM.

NAME.	Cause.	Appraised.
John Smith,	land damage, .	\$12 00
John Krug,	"	12 00
West Roxbury Land Company,	"	6 00
J. P. Wilson,	"	6 00
H. I. Jackson,	"	6 00
Union Congregational Society, South Weymouth, .	"	5 00
Boston Home Building Association,	"	2 00
Adeline F. Barber,	"	2 00
Francis J. Parker,	"	10 00
Mary W. Gardner,	"	30 00
Alfred Perron & R. O. Brossard,	"	10 00
John Noon,	"	20 00
John M. Noon,	"	30 00
Morris Louis & Israel Cohen,	"	8 00
Wm. D. Hennessey,	"	75 00
Jacob Fox,	"	10 00
Henry H. Savage,	"	5 00
Town of Brookline,	"	5 00
Henry H. Savage,	"	1 00
Henry H. Savage,	"	4 00
J. T. Cunningham,	"	20 00
Lutheran Church,	"	75 00
M. W. Cunningham,	"	20 00
West Roxbury Heights Land Company,	"	40 00
West Roxbury Heights Land Company,	"	20 00
Heirs of Edward Richards,	"	45 00
Mary C. Blakemore,	"	10 00
H. L. Horeux & A. E. Hentz,	"	10 00
George F. Doyle,	"	20 00
John Cochrane,	verdict,	11,400 00
Total,	-	\$11,919 00

ASSETS AND LIABILITIES, SEPT. 30, 1898.

ASSETS.

Office furniture, fittings and supplies, including fittings for field offices, stationery and railroad tickets,	\$2,501 23
Engineering instruments and supplies,	2,122 30
Engines, pumps, boilers, derricks, inclines, buckets, row boats, dump cars and heavy appliances,	3,199 00
Pumping station fixtures, tools and supplies,	6,744 15
Miscellaneous tools,	1,276 98
Miscellaneous supplies,	1,028 07
Engineers' field offices, sheds, barns and tool houses, . .	1,250 00
Carts, express wagon, horse and harnesses,	413 00
Stock yard and building, East Boston,	2,500 00
Land for stock yard, Hyde Park,	167 00
Vacant lots, Chelsea,	1,300 00
Vacant lots, Winthrop,	1,800 00
Cash received as follows:—	
Balance Sept. 30, 1897,	\$5,325 14
To sale of second-hand boiler,	75 00
sale of kerosene and naphtha,	10 43
sale of two engineers' transits,	200 00
sale of engineers' and inspectors' field offices,	30 00
grading clay pits,	9 25
changing man-hole,	26 48
sale of locker,	10 00
	\$5,686 30
Of this amount there has been paid the State	
Treasurer, as per receipts on hand,	3,009 08
	2,677 22
	\$26,978 95

There are numerous necessary plans, drawings, calculations and studies relating to the work, to which no stated value can be assigned; also about 69 miles of completed sewer, with pumping stations, siphons, and other accessories necessary for operating the systems.

LIABILITIES.

Amounts due contractors on estimates,	\$4,627 65
Amount unpaid on estimated land damages, including amounts barred by the statute of limitation and cases pending in court,	23,360 30*
Fraction of pay rolls (laborers),	344 07
Fraction of pay rolls (engineers),	702 90
Fraction of commissioner, chief engineer and clerical pay rolls,	1,308 34
Unpaid bills, — miscellaneous (see pages 46-51), . . .	55,764 89
	<hr/>
	\$86,108 15

There are amounts earned but not yet due contractors upon a very few sections of the work, which will be paid on succeeding estimates, or after the completion of the contracts; also claims of contractors (see page 51) not yet adjusted.

* The above amount does not include the following cases in court: city of Boston, land damages, claim, \$250,000; Amos Stone, land damages, claim, \$100,000.

